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THE
General Hiſtory
OF THE
AIR,

Deſigned and Begun

BY THE

Hon^{ble} *ROBERT BOYLE* Eſq.

IMPRIMATUR.
June 29. 1692.

Robert Southwell,
P. R. S.

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Advertiſement of the Publiſher to the READER.

THE Deſign of the following Papers the Author's own Preface will acquaint thee with. And though, as thou wilt there ſee, his Expectation of Aſſiſtance (in a Work too great for one ſingle Man's Undertaking) from others fail'd him, yet I doubt not but his own Experiments and Collections would have made this Treatiſe much larger before it had been publiſhed, had his Health allowed him Opportunity: But that permitting him not ſo much as to review theſe Papers, or range them into that order, which would be moſt advantageous, thou art not to wonder, if thou findeſt ſome Defects, ſome Diſlocations, and other Faults in this Publication, which the Author's laſt Hand would have prevented. The Negligence of Tranſcribers has let ſlip the Characters of Relators, and Names and Places of Author's from whom ſeveral of the Particulars in the following Papers were taken: Nor could it be hoped that the Authors own Memory (were he in a State of Health fit to be troubled with it) ſhould after ſo long a time as this Collection has been making, and in that Variety of Men and Books he has had to do with, be able to retrieve them. But this will be no great Loſs to the learned World, which is ſufficiently acquainted with his great Caution, and will make no Difficulty confidently to rely upon his unaffected Candor and Sincerity. I know not how much ſome other Parts of his noble, and always buſy Deſigns for the Advancement of Knowledg, and the Benefit of Mankind, may ſuffer by that

Tenderneſs of his Conſtitution, which the Importunity of his Friends can hardly prevail upon him to withdraw from Philoſophical Cares. But this he has ordered ſo, that imperfect as it is, one cannot call it deficient; ſince the Foundation being here laid, and the Draught made, every one may, if he pleaſe, add towards the compleating of the building, I will not ſay with Materials equal to what his Sagacity and Laboratory uſed to afford: For we must not expect to find in every Age a Man able and ready to lay out ſo much Coſt, Pains and Skill, frankly, for the Improvement of Natural Philoſophy, and the Information of the World, as he has done. The Scheme of Titles under which theſe Materials for a Hiſtory of the Air *are ranged, is ſomewhat different from that printed by him ſeveral Years ſince, and diſtributed amongst his Friends. But this is without any Prejudice to the main Deſign, ſince whatſoever any one hath collected under thoſe Heads, will be eaſily reducible to theſe, which in a more natural Order are more comprehenſive. In that firſt Draught he followed my Lord* Bacon's *Advice, not to be over-curious or nice in making the firſt Set of Heads, but to take them as they occur. But now that thus much comes to be publiſhed, which perhaps may ſerve to ſome Men as a common Place for the Hiſtory of the Air, the Titles have been a little more increaſed or methodized, to which any one may add as he finds Occaſion: Only in theſe the Reader is deſired to obſerve,*

I. *That under the Title of* Mineral Subſtances, *are comprehended Earth, and all other Foſſiles to avoid multiplying of Articles.*

II. *That when any mixed Body is ranked under* Animal, Vegetable, *or* Mineral Subſtances, *it is put under that of the three which either it partakes moſt of, or to which moſt is owing in the preſent Experiment, or which in its own Nature it moſt reſembles.*

III. *That it is not by an Over-ſight that* Lightning *is put under two different Titles; for in one it is conſidered only in reference to the Sight; in the other it is conſidered as the Product of ſulphureous or inflamable Effluviums taking fire, with the ſtrange Effects it produces; which may be an Example of puting the ſame thing with different Views, under different Heads.*

What is aboveſaid was written whilſt the Author was living, to which it is neceſſary now to add, That the Titles, as here printed, and the Order of the Papers, as now ranged under them, were ſhewn to the Author, and approved by him as fitter for the General Hiſtory of the Air, *than thoſe he had formerly printed. So that, Reader, thou haſt theſe Papers as they were prepared and ordered to be publiſhed in his Life-time; and they had then gone to the Preſs to be printed, juſt as thou now receiveſt them, had not the Publiſher the laſt Winter been haſtily called out of Town.*

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THE

THE PREFACE.

THE continual *Uſe* of the Air is ſo abſolutely neceſſary to our *Life*; the good or bad *Temperature* of it is ſo important to our *Health*; and the ſcarce evitable *Preſence* and powerful *Preſſure* of it, has ſo great an Intereſt in many of the *Phænomena* we meet with here below, and even in divers where its Agency is not ſuſpected; that among mere *Bodies* there are perhaps few Subjects that more deſerve our Curioſity, whether as we are Animals, or as we are Naturaliſts. Upon which Account I can ſcarce think that any thing that conduces to the fuller Knowledg of a Body ſo diffuſed, ſo neceſſary, and ſo powerful, is fit to be *deſpiſed*, or is unworthy to be *preſerved* in Writing.

And therefore, though I have formerly had occaſion to treat, in diſtinct Tracts, of ſome of the *Qualities* or *Affections* of the *Air*, as its *Gravity*, *Springineſs*, &c. yet I found my ſelf inclined to contribute further to the Knowledg of that vaſt and uſeful Subject, by ſetting down ſome *Memorials*, partly out of my own Obſervations and Trials, and partly out of thoſe I had from Perſons of good Credit, concerning ſome Cauſes and Effects of the Changes of the Air, and conſequently concerning ſeveral of its Qualities that were requiſite to be taken into Conſideration in a work of that Nature. And not content with this, though my own Studies and Affairs would not permit me to proſecute my ſelf the Deſign I am going to mention, yet thinking it might be a very uſeful thing, in reference both to Philoſophy and Phyſick, that a Natural Hiſtory of the Air (though at firſt it ſhould prove but a very imperfect one) were faithfully compiled, I propounded the Deſign to ſome *Virtuoſi* that ſeem'd to reliſh it, and undertook to be Aſſiſtant in it.

And to facilitate their Work, I drew up a Set of Heads and Inquiries of that ſort, which in another Paper I call *Titles of the firſt Claſſis or Order*; which, tho purpoſely ſet down without any anxious Method, were comprehenſive enough to have a good Number and Variety of Particulars conveniently referr'd to them. But afterwards finding the Perſons to whom I had committed theſe Schemes, to have been for many Years very unmindful of their Promiſes; I did on this Diſcouragement lay aſide, not only the Hopes of a *General Hiſtory of the Air*, but what I had already written about the Changes of that Body.

And upon the ſame Accounts, thoſe ſcattered Notes lay many Years in looſe neglected Papers, till at length the Curioſity and Deſires of ſome *Virtuoſi*, that knew I had gathered ſome Remarks, though few and incoherent, touching ſome Qualities of the Air, obliged me to draw together thoſe that without a troubleſome Search I could retrieve, offering themſelves to promote the Deſign that others had abandon'd. The Deſire to gratify theſe Inquiſitive Men, and the Conviction I am brought under, by ſuch Reaſons as are mentioned at the Beginning of this Paper, that ſcarce any Truth, whether Hiſtorical or Doctrinal, that relates to ſo important a Subject as the *Air*, is unfit to be preſerv'd, prevail'd with me, rather to chuſe a very diſadvantageous way of ſetting down what I have to deliver about it, than ſuffer the looſe Obſervations I had occaſion to make about ſome *Phænomena* and *Qualities*, and eſpecially the *Changes* of the Air, to be loſt. And therefore, though I have not the leiſure to methodize my incoherent Notes, and much leſs to weave them into continued Diſcourſes; yet rather than let them periſh, and diſappoint thoſe that will have them ſuch as they are, I am content to refer to ſome of the Titles prefixed to this Treatiſe, as to a kind of Common Places, what my Memory, or ſome old Notes about divers things relating to the Air, and eſpecially to the *Cauſes and Effects of its Changes*, ſupply me with in reference to that Body.

And upon the like Account, I have not ſtrictly confined my ſelf to the mention of my looſe Obſervations, and thoſe that I have been furniſhed with by Anſwers to the Queſtions I put to divers Travellers and Navigators: but I have alſo caſt in ſeveral pertinent Paſſages that chanced to occur to me in the reading of ſome Voyages, and other Books, eſpecially ſuch as either are *out of Print*, or are but *in few Hands*, or elſe are not extant in thoſe that are called the *Learned Languages*. And that thoſe *Virtuoſi* that are willing to contribute their Induſtry to carry on the Deſign that was at firſt propoſed, might have ſome Heads whereunto to refer what ſhall occur to them; I thought fit to premiſe to my Papers the above-mentioned Scheme, or rough Draught, of the *General Hiſtory* (which after many Years I chanced to recover.) I have alſo thought fit, that under three or four Titles, my Collections of Particulars ſhould be ſomewhat large and Methodical, to afford the ſame Perſons ſome *Specimens* of what I ſhould have thought requiſite to do upon particular Subjects, if

I would have ventur'd upon ſuch a Task, as to write a *Natural Hiſtory of the Air.*

I am not ignorant that I expoſe my ſelf to Cenſure, for ſuffering to paſs out of my Hands, Memoirs ſo maimed and imperfect, that ſeveral of the Subjects mentioned in the Scheme of Titles are left altogether untouch'd; and thoſe that are particularly mentioned, are for the moſt part touch'd upon but lightly. But the chief, though not perhaps the only Reaſons that kept me from being ſilenc'd by theſe Conſiderations, though I confeſs them to be weighty, were theſe. *Firſt*, That not pretending to write the *Hiſtory of the Air*, but only ſome Memoirs for it; I might without Incongruity or Indecency contribute what had occurr'd to me in reference to ſome of the Titles, though I left the others to thoſe that had made Experiments or Obſervations about them. *Next*, That having through the Fraud or Negligence of ſome Perſons, loſt ſundry looſe Papers that I had provided for the *Hiſtory of the Air*, my Unwillingneſs that the reſt ſhould undergo the ſame Fate, invited me to impart them to many, as the beſt Expedient to ſecure them. To which I, *Thirdly*, add an Inducement, which though laſt named, was the firſt in Efficacy, as that which made the other two ſignificant; namely, that I had more than once obſerved, that when a Work of this Nature has been once begun and taken notice of, in ſuch an inquiſitive and active Age as this of ours, it ſeldom fails to excite the Curioſity and Induſtry of others, whom, if the Deſign be any thing well laid, the Utility that it promiſes will invite to carry it on.

TITLE I.

What we underſtand by the AIR.

BY the *Air* I commonly underſtand that thin, fluid, diaphanous, compreſſible and dilatable Body in which we breath, and wherein we move, which envelops the Earth on all ſides to a great height above the higheſt Mountains; but yet is ſo different from the *Æther* [or *Vacuum*] in the intermundane or interplanetary Spaces, that it refracts the Rays of the Moon and other remoter Luminaries.

TITLE II.

Of the conſtant and permanent Ingredients *of the Air.*

A ſhort Anſwer to a Queſtion about the Nature of the Air, given by Mr. Boyle *to Mr.* H. Oldenburg.

As to your Queſtion, *What I think the Air to be?* I ſhall in the firſt place take it for granted, that by the Air you mean not, either the pure Element of Air, which *ſome*, nor that Etherial or Celeſtial Subſtance, that *others* (upon what Grounds I muſt not here examine) aſſert; but that, which I am wont to call the *Atmoſpherical* Air, which is that common Air we breath and move in.

But though I know you too well, to ſuſpect that you deſign any Ambiguity in your Queſtion; yet I ſhall not adventure to anſwer it, till I have premiſed a Diſtinction that is not uſual: For, according to my Thoughts, the Air may be taken *either* for that which is *Temporary*, (if I may ſo call it;) *or* in a *Tranſient* State; *or* that which is *Laſting*, and in a *Permanent* State. This Diſtinction, which perhaps you look'd not for, I ſhall illuſtrate by this Example; That if you ſufficiently heat an Eolipile furniſhed with Water, and ſtay a pretty while to afford time for the expulſion of the *Aerial* Particles by the *Aqueous* Vapours, you may afterwards obſerve,

ſerve, that theſe laſt named will be driven out in multitudes, and with a noiſe, and will emulate a Wind or Stream of Air, by blowing Coals, held at a convenient diſtance, like a pair of Bellows, and by producing a ſharp and whiſtling Sound againſt the edg of a Knife, held in a convenient Poſture almoſt upon the Orifice of the Pipe, whence they iſſue out. But this vapid Stream, though in theſe, and ſome other things it imitates true Air, whilſt the vehement Agitation laſts, which the Vapours it conſiſts of, received from the Fire; yet in a very ſhort time, eſpecially if the Weather, or the Veſſels it enters into, be cold, loſes the *temporary* Form it ſeemed to have of Air, and returns to Water, as it was at firſt.

This premiſed, I come to ſpeak *directly*, but dare not do it *confidently*, to your Queſtion: For though poſſibly I may have made as many Trials as another about the Nature of the Air; yet I freely confeſs to you, that I much ſuſpect there lies yet ſomething concealed in it, that needs a further Diſcovery, which may perhaps be made by further Trials. But in the mean time, (not wholly to baffle your Curioſity, ſince 'tis ſo modeſt, as to deſire to know of me, not what the true Nature of the Air is, but what I gueſs concerning its chiefeſt Property or Attribute) I will acquaint you with ſome of the Thoughts I long ago had, and which I yet took upon my ſelf, and deſire to have them look'd upon by you but as Conjectures, entertain'd only till farther Diſcoveries confirm them, or ſuggeſt better in their room.

It ſeems then not improbable to me, that our *Atmoſpherical* Air may conſiſt of *three* differing Kinds of Corpuſcles. The *firſt* is made of that numberleſs Multitude and great Variety of Particles, which, under the form of Vapours or dry Exhalations, aſcend from the

Earth,

Earth, Water, Minerals, Vegetables and Animals, *&c.* and in a word, of whatever Subſtances are elevated by the Celeſtial or Subterraneal Heats, and made to diffuſe themſelves into the Atmoſphere. The *ſecond* ſort of Particles that make the Air, may be yet more ſubtile than the former, and conſiſt of ſuch exceeding minute Parts, as make up the *Magnetical* Steams of our Terreſtrial Globe, and the innumerable Particles, that the Sun and other Stars, that ſeem to ſhine of themſelves, do either emit out of their own Bodies, or by their Preſſure thruſt againſt our Eyes, and thereby produce what we call *Light*; which, whether we explicate it by the *Epicurean* or *Carteſian* Hypotheſis, argues a great Plenty of a Celeſtial, or ſome other very ſubtile Matter, to be diſperſed through, or harboured in the Intervals of the ſtabler or groſſer Corpuſcles of the Atmoſphere.

But becauſe you expect from me a diſtinguiſhing, and as it were, *Characteriſtick* Quality, which may put a difference between the Parts already named of the Atmoſphere, and thoſe to which moſt of the *Phenomena* of our Engine, and many other Pneumatical Experiments, ſeem to be due; I ſhall add a *third* ſort of Atmoſpherical Particles, compared with which, I have not yet found any, whereto the Name of Air does ſo deſervedly belong. And this ſort of Particles are thoſe, which are not only for a while, by manifeſt outward Agents, made Elaſtical, but are *permanently* ſo, and on that account may be ſtil'd *Perennial* Air.

Of the Structure of the Elaſtical Particles of the Air, divers Conceptions may be framed, according to the ſeveral Contrivances Men may deviſe to anſwer the *Phenomena*: For one may think them to be like the *Springs* of *Watches*, coil'd up, and ſtill endeavouring to fly abroad.

broad. One may alſo fancy a Portion of Air to be like a Lock or Parcel of curled *Hairs* of *Wooll*; which being compreſſed by an external Force, or their own Weight, may have a continual endeavour to ſtretch themſelves out, and thruſt away the neighbouring Particles, and whatever other Bodies would hinder them to recover their former State, or attain their full Liberty. One may alſo fancy them like extreamly *ſlender Wires*, ſuch as thoſe of Gold and Silver, that Tradeſmen unwind from ſome Cylindrical Bodies of differing Sizes, on which they were rolled; which Pieces of Spiral or curled Wire may be, *as* of differing Subſtances and Conſiſtences, *ſo* of very differing Lengths and Thickneſſes, and have their Curls greater or leſſer, nearer each other, or more diſtant, and be otherwiſe diverſified; and yet all have Springineſs in them, and (notwithſtanding) be, by reaſon of their Shape, readily expanſible on the ſcore of their native Structure, as alſo by Heat, Girations, and other Motions; and compreſſible by an external Force into a very little room. I remember too, that I have among other Compariſons of this kind, repreſented the ſpringy Particles of the Air, like the very *thin Shavings of Wood*, (that Carpenters and Joiners are wont to take off with their Plainers;) for, beſides that theſe may be made of differing Woods, as Oak, Aſh, Firr, *&c.* and thereby be diverſified as to their Subſtance, they are uſually of very various Breadths, and Lengths, and Thickneſſes. And perhaps you may the rather prefer this Compariſon, becauſe it may ſeem ſomewhat to illuſtrate the *Production* of the ſpringy Particles of the Air: for to make theſe Shavings, there is no Art nor curious Inſtruments required; and their Curls are no ways uniform, but many ways differing, and ſeemingly caſual; and, which is chiefly conſiderable, theſe

Shavings are producible out of Bodies, that did not appear, nor were ſuſpected to be Elaſtical in their Bulk, as Beams and Blocks; almoſt any of which may afford ſpringy Shavings, barely by having ſome of its Parts ſo taken off, as to be thin and flexible enough, and commodiouſly ſhap'd: Which may perhaps illuſtrate what I tried, that divers ſolid, and even mineral Bodies, not ſuſpected of Elaſticity, being put into corroſive Menſtruums, devoid of that Quality, there will, upon the convenient Comminution of Parts, inſuing the Action and Re-action, that paſſes between them in the Diſſolution, reſult or emerge a pretty Quantity of permanently Elaſtical Fire. But poſſibly you will think that theſe are but extravagant Conjectures; and therefore without adding any thing in favour of them, I ſhall proceed, and willingly grant, that one may fancy ſeveral other Shapes (and perhaps fitter than theſe we have mentioned) for theſe ſpringy Corpuſcles; about whoſe Structure I ſhall not now particularly diſcourſe, becauſe of the variety of probable Conjectures that, I think, may be propoſed concerning it. Only I ſhall here intimate, that though the Elaſtical Air ſeem to continue ſuch, rather upon the ſcore of its Structure, than any external Agitation; yet Heat, that is a kind of Motion, may make the agitated Particles ſtrive to recede further and further from the Centers of their Motions, and to beat off thoſe, that would hinder the freedom of their Gyrations, and ſo very much add to the endeavour of ſuch Air to expand it ſelf. And I will allow you to ſuſpect, that there may be ſometimes mingled with the Particles that are ſpringy, upon the newly mentioned Account, ſome others, that owe their Elaſticity, not ſo much to their Structure, as their Motion, which, variouſly brandiſhing them and whirling them about, may make them beat off the neighbouring Particles, and thereby promote an expanſive Endeavour in the Air, whereof they are Parts. And though ſome of theſe may, in very cold Climates and Seaſons, prove to be of thoſe, which I not long ſince referr'd to *temporary* Air; yet others of them may be ſo minute and agile, and ſo advantageouſly ſhap'd, that at leaſt in our Climate, the Air will ſcarce be ſo cold, but that the Cauſes, which entertain the Agitation, and keep it fluid, may alſo give a competent Motion to Particles ſo well diſpoſed to be kept in it.

And now, Sir, 'twill be time to indeavour to proceed to ſome Particulars, that may countenance the Conjectures I have hitherto been propoſing.

Having not now the leiſure to proſecute this Diſcourſe uninterruptedly, till it be compleatly finiſh'd, I thought it not unfit, not only to ſet down, in this Paper, ſome of thoſe occurring Thoughts and Obſervations of my own, upon this Subject, that were the likelieſt, unleſs this way preſerved, to vaniſh out of my Memory, and which may ſerve to recal divers others into it; but alſo to annex ſome Paſſages referable to the ſame Purpoſes, borrowed from ſuch Books, as probably I may not have at hand, when I ſhall reſume this Treatiſe. Theſe two ſorts of Paſſages make up the following Notes, and are therefore to be look'd upon but as materially here laid together to be preſerved, not ſo much for themſelves (though ſome of them perhaps deſerve not to periſh) as in Order to the finiſhing of the deſign'd Structure. And though, for that Reaſon, they may often appear very confuſedly placed, yet they may ſeem more incoherent than they are, there being certain Tranſitions, and other things, by which ſome of them may be ſo connected, as to be fit to make diſcourſive Parts and Paragraphs of the Treatiſe they belong to;

upon which Account 'tis that they are put at divers Diſtances one from another, that if hereafter I have leiſure, there may be room for the Tranſitions, *&c.* by which they are deſigned to be connected into coherent Diſcourſes.

What is above ſaid in reference to this Tract in general, is applicable to thoſe particular Parts of it, whether Chapters or Sections, or other Diviſions that follow a Line of Aſtericks, ſuch as the enſuing * imployed to ſeparate the unfiniſh'd Part of the Diviſion it belongs to, from the foregoing.

TITLE

TITLE III.

Of the Æther *in the Atmoſphere.*

TITLE IV.

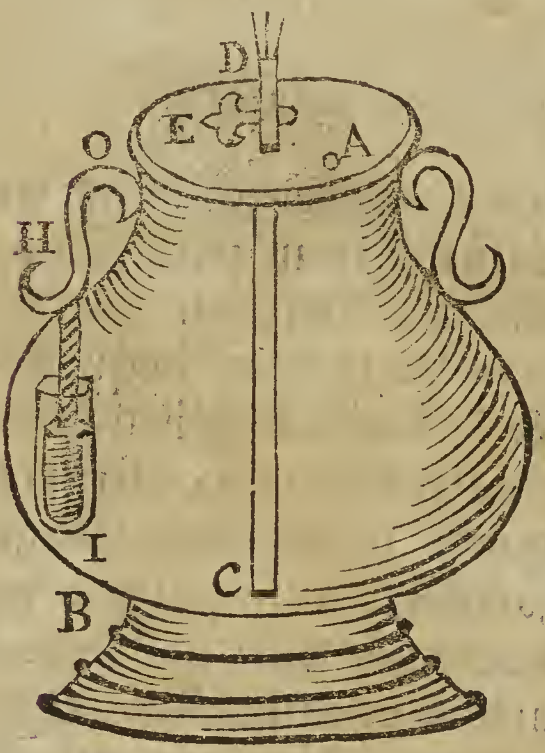
Of the Springy *Particles of the Air, and the Spring of the Air.*

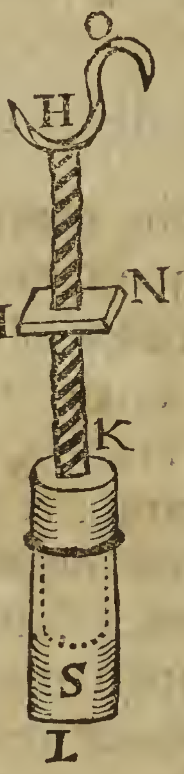
Aerem validè comprimere, aut dilatare.

Caſati Mechanicorum, lib. 8. cap. 5. p. 792, 793, &c.

FOllibus luſoriis aerem pyulco ingerentes majorem ſubinde atque majorem difficultatem percipiunt; quo enim magis aer concluſus à naturali raritate recedere cogitur, etiam majore niſu reſiſtit, neque ſolùm magis denſari renuit, ſed & ſe latiùs explicare molitur. Hinc didicimus & pneumaticos fontes conſtruere, qui ſpiritu interno urgente aquam in altum evibrant, & plumbeas glandes fiſtulis ejaculari, non pulvere nitrato ignem concipiente, ſed aere per vim denſato ad antiquas dimenſiones recuperandas erumpente. Quoniam verò ingeſta jam in conceptaculum non exigua aeris copia difficiliùs comprimitur novâ aeris acceſſione, quàm ut manus valeat truſillum rectâ impellere; idcirco truſilli haſtulam deformatam in helicem, & ſuæ matrici inſertam, adhibere operæ pretium erit: dum enim manubrio agitante contorquetur cochlea, ſenſim deprimitur embolus, aeremque ingerit. Ne autem morâ longiore opus ſit perpetuâ verſatione manubrii, ita cochleæ matrix externam vaſis faciem contingat, ut illi adnecti, atque ab eo disjungi valeat: initio enim, quando adhuc levis eſt aeris modicè compreſſi reſiſtentia, lamella illa ſuo foramine interiùs claviculatim ſtriato cohærens haſtulæ emboli, ſi à vaſe disjuncta fuerit, unà cum haſtulâ movebitur: deinde vero, quando jam truſillis ægrè impellitur, lamella illa cum vaſe connectatur, & non niſi verſato manubrio adduci atque reduci embolus poterit, id quod ſatis lentè perficietur. Rem claritatis gratia in fonte pneumatico explicemus.

Sit vas A. B. ex materiâ metallicâ, in cujus ſuperiore parte labrum; ex quo per foramen A. immittatur in vas aqua, ita tamen, ut non impleatur; aqua enim in vas modicè inclinatum deſcendens, aerem expellet per tubulum C. D. ubi ſatis aquæ immiſſum fuerit, occludatur foramen A. diligentiſſimè cochleolâ congruente, & convoluto epiſtomio E. tubus D. C. ſit aeri impervius ad vaſis latus ſtatuatur modiolus cum embolo congruente H. I. & emboli haſtula ſit connexa cum mobili vaſi anſa H. O.





Porrò haſtula H. K. perforata ſit, & continuo ductu uſque ad emboli K. S. fundum pateat aeri ingredienti via H. S. ſed foramini S. adjecta ſit valvula, quæ aeri regreſſum obſtruat. Similiter modioli fundo in I. valvula exteriùs appoſita aperiatur ingeſto aeri tranſitum præbens; ſed aeri intra vas compreſſo cum nuſquam exitus pateat, valvula ipſa modioli foramen I. occludit. Haſtulæ verò H. K. exterior facies ſit in helicem ſtriata, & lamellæ M. N. tanquam matrici congruat, quæ in M. & N. cochleolis adnecti queat exteriùs vaſi, quaſi eſſet anſæ fulcrum.

Ubi immiſſum fuerit quantum ſatis eſt aquæ, cochleolis M. & N. revolutis disjungatur matrix à vaſe: tum attractâ anſâ H. O. unà cum lamellâ M. N. attrahitur embolus K. S. & per apertum ductum H. S. ingreditur aer, modiolum implens. Impulſo deinde embolo, valvula ad S. clauditur, & aer ex modiolo per patentem valvulam I. ingeritur in vas; ex quo nequit exire, neque aquam propellere, clauſo ſcilicet epiſtomio E. & foramine A. qua propter comprimitur, & denſatur; ideoque attracto denuo embolo K. S. incluſus vaſi aer ſe latius explicare connitens valvulam I. valide applicat foramini modioli, ſibique exitum obſtruit. Toties adducitur atque reducitur embolus, & aer ingeritur, quoad magna premendi difficultas percipiatur; ubi eò ventum fuerit, tunc lamella M. N. iterum vaſi adnectatur ſuis cochleolis; nec jam embolus rectâ adduci poteſt; ſed areptum in O. manubrium verſatur,& embolus intrà modiolum circumactus ſenſim attollitur, qui deinde revoluto in contrarium manubrio deprimitur, & multâ vi aer in vaſe comprimitur. Laxato demum Epiſtomio E. compreſſus in vaſe aer, aquam exprimit per tubum C. D. primùm quidem vehementius, ſubinde remiſſius, prout aeris vis elaſtica ſenſim longueſcit.

Hoc idem quod de aere intra vas comprimendo ad aquam evibrandam comminiſci placuit, ſervatâ analogiâ, dicendum eſt de aere, tum conatu manûs rectâ truſillum impellentis, tum ope cochleæ ſimiliter conformatæ, intrà conceptaculum comprimendo, ut ex fiſtulâ deinde multâ vi emittatur plumbea glans, ubi reſeratus aeri exitus illum ſubitò dilatari permiſerit. Quin & pneumatica hujuſmodi tormenta citrà conceptaculum aeris compreſſi conſtruere non inutile accidat, ſi, quemadmodum noſtrates pueri ſurculos ſambuceos fungosâ medullâ exhauriunt, & utraque tubuli extremitate papyraceis globulis obſtructâ, alterum globulum congruo cylindro propellunt, atque incluſum aerem denſant, quoad aeris vim elaſticam, & impellentis manus conatum non ferens extremus alter globulus edito ſcloppo expellatur; ita ferream fiſtulam longiorem paraveris, cujus alteri extremitati immittatur plumbea glans obducta papyro, aut ſimili materiâ, ut exquiſitè tubi oſculum implens demum univerſam aeris vim excipiat, alteram extremitatem aliquot ſpiris ambiat cava cochlea, quam impleat cylindrus ferreus in congruentem cochleam deformatus; ſi enim hujuſmodi cylindrus vix brevior fuerit, quàm fiſtula, & apto manubrio convolutus in fiſtulam ſenſim immittatur, totum aerem, quo fiſtula replebatur, ad exiguas ſpatii anguſtias adiget, ex quibus magnâ vi demum, quâ data porta, erumpens ejaculabitur plumbeum globulum.

TITLE V.

Of the Magnetical *Particles in the Air.*

TITLE VI.

Of the Deſtruction, Generation, Abſorption *and* Extrication *of the Air.*

New Experiments about producing of Air. *And examining the Bodies produced.*

THAT the Air has a great Intereſt in the Production of many Phenomena of Nature, either not formerly known, or not formerly aſcribed unto it, as the chief Agent, if as any at all, has been, I ſuppoſe ſufficiently manifeſted by our own Experiments, as well as by thoſe publiſhed by abler Writers.

That alſo the Air is neceſſary not only to the well-being, but to the verry Being and Motions of the Generality of Animals, will be eaſily deduc'd from thoſe Trials whereby we have made it appear, that Animals whoſe Blood is hot, may be killed in our Engine by the withdrawing of the Air in about one Minute of an Hour, and that even thoſe minute Creatures, whoſe Blood or Analogous Juice is cold, will for the moſt part, without excepting Cheeſe-Mites themſelves, preſently loſe all their viſible Motions, upon the Receſs of the Air, may appear from our Experiments about Reſpiration.

Wherefore the Air, being a Body ſo important in our Speculations of Nature, and ſo neceſſary to the

Continuance of our Lives, I could not but think it deſerv'd, that we ſhould ſolicitouſly inquire, whether it may or may not be produc'd by Art; for if it can be ſo by any, not very uneaſily practicable ways, the Diſcovery may not only help us to explicate ſome difficult Phenomena of Nature, but may afford us, among ſeveral other Uſes, that of enabling us to ſupply divers, if not alſo ſubmarine Navigators with freſh Air produced under Water, and thereby lengthen their ſtaying in Places, where the Continuance of it may be of great Uſe both ſpeculative and practical.

Upon theſe and the like Motives, I reſolv'd, notwithſtanding the Difficulties I foreſaw my Curioſity would meet with in ſo new an Attempt, to try what I could do. But before I relate the Succeſs of this Attempt, I muſt premiſe a couple of neceſſary Advertiſements.

And firſt, when I here ſpeak of Production of Air, I deſire to be underſtood in a familiar Senſe, meaning by that Expreſſion the obtaining a ſenſible Quantity of Air, from Bodies wherein it did not appear before they were handled after our way, that ſo much Air, if any at all, was pre-exiſtent. This I ſay, becauſe I would not in this Place needleſly ingage in the Controverſy about the Ingenerability (as they ſpeak) or the mutual Tranſmutation of the Bodies that are called Elementary: for though I am not ſure, but that ſome of our Experiments may argue a new and real Production of Air, or a Generation of it in the ſtricter Senſe, yet I ſhall now imploy the words Generation and Production, in the large and popular Acception, and would ſignify by them, as I lately intimated, the obtaining of a ſenſible Quantity of Aerial Subſtances from Bodies, that did not appear to have it, whether this obtain'd Subſtance were due to an Extrication and Union of Aerial Particles latent in the Pores of the Bodies that afforded it, or to a real Production or Generation of Air, no where exiſtent antecedently to our Experiments. And this is the firſt of my two Advertiſements.

The ſecond is this, That among the Difficulties, I foreſaw, in making Experiments ſuited to my Deſign, I look'd upon it as one of the greateſt, though the leaſt obvious, that to ſatisfy ſuch a Diſpoſition as mine, that is naturally prone enough to queſtion things, it would be requiſite for me to conſider, and, if I could, to determine by appropriated Trials, whether the fluid Subſtances my Experiments might afford me, deſerv'd the Name of Air or not. Wherefore I ſaw my ſelf oblig'd to increaſe my Task, and ſo direct my Inquiries, that in the firſt Place they may afford me ſenſible Portions of ſuch a Subſtance, as in a popular Senſe may be ſtiled Air, whether theſe obtain'd Subſtances ought to be look'd upon as true Air or no. So that my intended Diſquiſition would naturally conſiſt of two Parts, whereof the former was to contain the ways of producing, that which ſeems Air; and the other to propound thoſe of examining, how far the produc'd Subſtance is indow'd with the Qualities, that are judg'd to belong to Air as ſuch.

But in regard that I thought it moſt convenient ſo to contrive my Experiments, as to make ſuch of them as I could to ſerve me, both to produce Air, and to examine it, I ſhall be more than once obliged to mingle the two Parts of my Diſquiſition, and reſerve for the latter of them, only thoſe few Trials, that concern purely the Examen of the produced Air.

And upon this Score it will be ſeaſonable to take notice in this Place, that foraſmuch as there are divers Qualities aſcribed to Air, which to me ſeem but accidental, and not univerſally to belong to Air as ſuch, I have not obſerved any one Attribute that I think to be ſo much the Property of Air, and ſo fit to diſtinguiſh its true Particles from aqueous Vapours, earthy Exhalations, and the *Effluvia* of other Bodies, as a durable Elaſticity or Springineſs. And therefore I ſhall henceforth imploy that, as the chief Criterion, whereby to conſtitute a Portion of Matter Aerial, and diſcriminate it from other flying and fluid Subſtances, and conſequently to allow or deny it the Title of Air.

Now among the ſeveral Ways I thought of, whereby to produce Air, thoſe I judg'd fitteſt to put in practice were theſe. 1. By Fermentation. 2. By Corroſions and Diſſolutions of Bodies. 3. By boiling of Water and other Liquors. 4. By the mutual Actions of ſome, eſpecially ſaline Bodies, upon one another. 5. By the Analyſes and Reſolutions of certain Subſtances.

Experiment I.

On *January* 17, we conveyed into a long and large Tube ſome Filings of Steel, and as much Water as was thought convenient to dilute the Oil of *Vitriol*, which we alſo conveyed in a peculiarly ſhap'd Glaſs, ſeal'd at both Ends, but with a Hole opened near one of them; the external Tube, and the Water in them being exhauſted, and the *Mercury* in the Gage, which we had alſo included, being ſo far impelled up into the open Leg, that there was ſcarce any at all left in the ſeal'd one; this, I ſay, being done, the external Tube was by our way exactly cloſed: and then the Oil of *Vitriol* being by little and little, and at good Intervals of Time, poured out of the internal Tube, to actuate the Water, there were produced exceeding large Bubbles by the Action of the Solvent upon the Metal, which alſo produc'd a ſenſible Heat, though not a great one. When this

Conflict had laſted a while, we obſerved, in compliance with the chief Scope of this Experiment, whether there would be any ſpringy Air produced by all thoſe Bubbles; and we perceiv'd that there ſeem'd to be ſo much of it generated, that at length the *Mercury* in the Gage was impell'd to the very bottom of the open Leg, and the Air included in the other ſeemed to be more compreſs'd than it had been when it was put in by the Weight of the Atmoſphere. But to try whether this Spring (wherein the Warmth, formerly mentioned, might be ſuſpected to have for that time ſome Intereſt) would continue, I removed the Tube into another Room where was no Chimny; and coming to look on it the next Day, did not take notice of any ſenſible Alteration in the Gage; and with the like Succeſs I viſited it for three or four Days: But then coming one Day to look upon it, I found the *Mercury* in the Gage to have aſcended about one Inch and an half, and about that quantity of Water to have got into the ſealed Leg; which inclined me ſo much the more to ſuſpect, that this Change in the Gage might have been accidental, a Boy having unknown to me removed the Tube from its wonted Station, to place ſomewhat elſe there, without doing it heedfully enough. And this Conjecture ſeems the more likely, becauſe I have not ſeen any notable Change to have happened in the Gage from that time to this, (which is the 25*th* of *January* at Night) the *Mercury* in the open Leg being about one Inch and an half.

March 8. A Glaſs Vial holding about a Pint (by gueſs) was filled with Wheat Flower, and as much Water as was ſufficient to drench it well. Afterwards the Orifice was exactly and ſtrongly cloſed with a Cork, and an excellent Cement: the Glaſs was ſet in a warm Place of the *Experiment* II.

Laboratory, becauſe of the Coldneſs of the Seaſon; and having ſtood there a Fortnight bating one Day, it this Morning broke by the mere Dilatation of the included Matter, whoſe viſible Part was laſt Night obſerv'd to leave a conſiderable Part unfill'd beneath the Cork. Notice was taken by the Laborant of the Event of this Trial, by a Noiſe which yet was no louder than one made upon the burſting of the Glaſs into ſeveral Pieces: To my Taſte the included Matter was but a little ſouriſh, but another afterwards judged it to be manifeſtly acid.

Experiment III.

March 9. Having on the 23*d* of *February* put into a pretty large Bolt-head a convenient Quantity of bruiſed Raiſons, with as much Water as I thought neceſſary to make them ferment; and having cauſed the Air to be carefully pump'd out, and taken ſufficient Order to keep any from forcing or ſtealing into the Glaſs, I ſet it in the Laboratory, that the Warmth of the Air might facilitate the Fermentation. At the end of four or five Days, it did not appear by a Mercurial Gage, (which had been purpoſely incloſed together with the Raiſons) that there was generated any ſpringy Subſtance. But being hindred by ſeveral Occaſions from looking after this Glaſs from time to time, it ſeems the contained Liquor fermented more violently than the time of the Year would have made one expect: for about four of the Clock in the Afternoon, no body being in the Laboratory, the Glaſs flew in pieces with a loud Noiſe like the Report of a Piſtol; which alarming a Domeſtick of mine, that was in a Chamber not far off, made him haſten to the Laboratory, where he found the Raiſons thrown all about, and the middle part of the Bolt-head (for the Bottom and the Pipe were intire enough) ſcattered into ſuch little Pieces, that they ſeemed almoſt to be vaniſhed.

On the 22*d* of *February*, I filled a Glaſs that had a ſomewhat wide Mouth, and might hold by Eſtimation three Pints (or Pounds) of Water; to which that Liquor, and a convenient Quantity of bruiſed Raiſons upon the Orifice of the Glaſs, were tied the Neck of a pretty large Bladder, out of which the Air having been diligently expreſs'd, it was ſtrongly faſtned to our Glaſs with one of our cloſe Cements; ſo that by ſqueezing the Bladder, we could not perceive that any Air could get in or out. Then, this done, we left the Glaſs in a convenient Place in the Laboratory, till the 8*th* or 9*th* of *March*; and then finding the Bladder to be pump'd up, we would have tied up the contained Air, but could not do it by reaſon of an imperceiv'd Hole, perchance made with the Point of a Pin, by ſome one of them that handled it. Wherefore taking off this Bladder, we cauſed another that was very limber, to be put on after the manner newly deſcribed; and yeſterday Morning we found it, though by Eſtimation it might hold about two Pounds of Water, to be ſo full of Air, that we could not without difficulty, and loſing a pretty deal of the contain'd Air, tie the Bladder very cloſe near the Neck of it.

Experiment IV.

And to try whether this ſame Mixture would continue to produce Air, (whether fermented or not, I muſt not here diſpute) I cauſed another Bladder to be faſtned to the ſame Glaſs as before, and found it this Morning *March* 11. as full as if it were diſtended with a Pair of Bellows.

April 28. Into the bottom of a wide-mouth'd Vial we put ſome good Spirit of Salt, and Filings of Steel, and

Experiment V.

whelm'd over it a R^r^. fitted with an Eel-skin and a Wire; to the latter of which was tied a thin Glaſs-Veſſel, hermetically ſeal'd at the bottom, tho 'twas but ſlender, and furniſhed with a competent Quantity of Filings of Copper, then we exhauſted the R^r^. well with our Engine, and afterwards by thruſting the Glaſs that held the Filings againſt the bottom of the Vial, we broke it off, upon which the Filings fell into the Menſtruum, which acting upon them, there enſued good ſtore of Bubbles that made a Froth much deeper than was the Liquor, and the ſucceſſive Generation of theſe Bubbles continued a good while, and appear'd ſome of them large enough, though in the free Air they would ſcarce have been viſible, or at leaſt would not have been taken notice of, the Vial having been kept in our *Vacuum* for a Quarter of an Hour longer, and no Greenneſs to be ſeen in the Liquor, the R^r^. was taken off, and the Vial left open to the Air.

Experiment VI. A Bubble of Air, whoſe Diameter was near in length to that of a middle ſiz'd Pea, was left at the top of a round Vial with a long narrow Neck, whoſe Cavity was fill'd with fine Oil of Turpentine, and then being inverted into a Vial fill'd with the ſame Liquor, was ſet aſide in a quiet Place, and left there for a competent time. Another Vial ſhap'd like the former, but a pretty deal leſs, was fill'd Neck and all with Alcohol of Wine, ſave a Bubble of Air about the ſame Bigneſs with the former: This Vial being inverted into another furniſh'd with the ſame Liquor, was ſet aſide in the ſame Window with it, and at the ſame time: The Event was, that about the End of the *6th* Day, the Bubble diſappear'd in the Glaſs that contain'd the Oil of Turpentine. And the like Abſorption, if I may ſo call it, I obſerv'd to have been made of the Air by the contiguous Spirit of Wine, the next Day after.

May the 23*d.* We open'd another exhauſted Receiver, wherein was an unſtop'd Vial more than half full of an opacous and blackiſh Liquor, which we gueſs'd (for we found no Inſcription belonging to it) to have been Frogs Spawn, and were ſure to have been included at leaſt three Years: By the Mercurial Gage that was put up with it, it appear'd to have afforded ſome Air, but not very much. Its Smell was ſtinking, much like that of the Pump of a Ship, but yet it had produc'd no Inſects, nor had any Appearance of Mouldineſs. *Experiment* VII.

A Gentleman of my Acquaintance, an induſtrious Digger for Mines, and Owner of a good one, informs me, that when the Miners meet with running Water under Ground, they are thereby ſupplied with Air enough for free Reſpiration: And when I ask'd whether he thought that Air was produced or extricated by the Motion of the Water, or elſe were only concomitant to the Stream? He anſwered, that it ſeemed to him more like to proceed from the Water it ſelf: and further anſwered me, that ſtanding Waters did not afford Air to the Diggers; and that running Waters did it even at conſiderable Depths, amounting to many Fathoms. *Experiment* VIII.

Experiments about the Production of Air, and the examining thereof propoſed.

Sect 1. TO produce Air by Fermentation in exactly cloſed Receivers.

To produce Air by Fermentation in ſeal'd Glaſſes.

To ſeparate Air from Liquors by boiling.

To ſeparate Air from Liquors by the Engine.

To produce Air by Corroſion, eſpecially with Sp. *Aceti.*

To ſeparate Air by Animal and ſulphureous *Solvents.*

To obtain Air in the exhauſted Receiver by burning Glaſſes, and red hot Irons.

To produce Air out of Gun-powder, and other nitrous Bodies.

Sect. 2. Examine the produc'd Aerial Subſtance by its preſerving or reviving. 1*ſt.* Animals. 2*dly.* Flame. 3*dly.* Fire. 4*thly.* The Light of rotten Wood, Fiſh.

To examine it by its Elaſticity, and the Duration thereof.

As alſo by its Weight.

And by its lifting up the Smoak of Liquors.

TITLE VII.

Of the Accidental or leſs conſtant Ingredients *of the Air.*

TITLE VIII.

Of Aqueous Particles in the Air, and of the Moiſture *and Drineſs of the Air.*

I Shall not here determine whether in all the Inſtances that are referr'd to this Title, the Phenomena be produced by the meer Moiſture of the Air as ſuch, or by ſome other Agents, whoſe Corpuſcles are accompanied and aſſiſted by the moiſt Air as a Vehicle and a concurrent Cauſe. But without nicely diſtinguiſhing the Grounds of particular Operations, we ſhall refer the Phenomena in general to the Moiſture of the Air, (or moiſt Air) that Quality being the moſt obvious to be obſerv'd in theſe Phenomena; in the Production of ſome of which it ſeems either the only, or the main Cauſe, in others an aſſiſtant Cauſe, and in all a not uſeleſs Concomitant.

The Account upon which a Body is dry, being uſually but this, that the Pores intercepted between its more ſtable Parts, are not fill'd with any viſible Liquor, it is not to be expected that a Quality ſo near of kin to a Privation, ſhould furniſh much to our preſent hiſtorical Notes: But yet Drineſs may ſometimes have a not-inconſiderable Intereſt in the Changes of a Body, and that upon differing Scores, whereof I take theſe two to be the chief. 1*ſt*. As the Body by Exſiccation is deprived of thoſe liquid and exhalable Parts that were before harbour'd in its Pores, and were perhaps the Principle of divers Operations aſcribed to it. And, 2*dly*. As theſe Evaporable Parts by their Receſs may occaſion a Change of Texture in the Body, eſpecially in regard of the Pores, whoſe Bigneſs, Figure, and perhaps Poſition, being alter'd, the Body by this Change of Texture acquires a Diſpoſition to act, and be acted on, in ſeveral Caſes, otherwiſe than formerly.

A Tranſcript of an Obſervation made at Stanton.

Sometimes when the Weather began to be overcaſt, the Hygroſcope did not ſenſibly appear to grow heavier, and ſometimes it would preponderate when I took notice of no Vapours to make it do ſo: and though theſe things happen'd but ſeldom, in reſpect of the ordinary Changes of the Hygroſcope according to thoſe of the Weather; yet they made me ſuſpect that ſometimes the Clouds may conſiſt of other Steams than *Aqueous*, or that there may be ſome Exhalations that may have a peculiar Congruity with the Pores of the Hygroſcope, and whoſe Nature may be ſuch as to the Power of drying the Hygroſcope, that upon theſe or ſome other, yet unheeded Accounts, the Steams that are ſometimes diffuſed in the *Air*, may controul the uſual and regular Cauſes of increaſing or leſſening the Gravity of the Hygroſcope. And this Suſpicion was the ſtronger, becauſe having made Hygroſcopes with Powder and Salt, and alſo with the Saw-duſt of Wainſcot, hung at nice Scales in very thin open Glaſſes, purpoſely blown for Lightneſs ſake at the Flame of a Lamp, though they uſually acquired and loſt Weight, as the Weather grew moiſter or drier, yet ſometimes they did not.

Experiment I.

At half of an Hour after nine a Clock at Night, I look'd upon the Half Hundred Weight that hung at the bottom of the Rope, the Weather being then fair, and a Mark being put at that part of the erected Board where the bottom of the Weight touch'd, I perceiv'd the Sky a while after to grow cloudy and overcaſt, but without

Rain; wherefore going to viſit the Weight again, I found it to be riſen $\frac{1}{4}$ of an Inch or more; and looking on my Watch, perceiv'd there had paſs'd an Hour and a Quarter ſince the Mark was made.

This Morning I came again to look upon the Weight between eight and nine of the Clock, and found it raiſed above the newly mentioned Mark, made laſt Night about one Inch, (for 'twas about $\frac{9}{8}$ of an Inch.) This Day the Weather being fair and windy, the Weight was fallen by ten at Night about ſix Inches beneath its Station, at which I found it when I look'd on it in the Morning.

Being not well yeſter-night, the Weight was obſerv'd at Bed-time, by two of my Servants, and it then reſted at the 11*th* of the erected Bound. This Morning about eight of the Clock, I viſited it my ſelf, and found it to be riſen about $\frac{1}{8}$ of an Inch above the eighth Inch, the Morning being cloudy, though the Morning very dry and duſty. The Weather growing more overcaſt, within ſomewhat leſs than an Hour after, I viſited the Weight again, ſome ſcatter'd Drops of Rain then beginning to fall, and found it to be riſen about half an Inch above the newly mention'd eighth Mark.

I look'd when I was ready to go to Bed upon the ſuſpended Weight of 56 Pound, and mark'd how low it reach'd upon the divided Board; and a great part of the Night having been rainy, I look'd again when I was dreſs'd in the Morning, which was about half an Hour after eight a Clock, and I found the Cord ſo ſhrunk, that the Weight was raiſed above five Inches higher than I left it the Night before; but the Day recovering dry and windy, and ſometimes warm, the Rope was ſo ſtretch'd, that at Night the Weight ſunk a good way beneath all the Marks. *N. B.* The Rope near the Weight was in Diameter $\frac{3}{10}$ of an Inch, and four decimal Parts of a tenth.

Experiment II. We took a Rope of near three Foot and an half in length from the Point of Appenſion, and ſomewhat leſs than $\frac{3}{10}$ (Inch) in Diameter; this we ſuffer'd to be ſtretch'd for ſome Days by a Weight of Lead with an Iron Ring or Anſula, weighing a Quarter of an Hundred, according to the great Hundred, which is five ſcore and twelve: and then placing a flat Board under it ſo, that the Weight juſt reſted upon it, we had the Rope well wetted over them with a Spunge dip'd in Water, and ſo often applied to it, that the Liquor might be thorowly ſoak'd into the Pores of the Rope, which at firſt ſeem'd thereby a little ſtretch'd, rather than ſhorten'd; but after an Hour or two it began to ſhrink, ſo that we could make the Weight ſwinge like a Pendulum over the Piece of Board it lean'd upon before. But afterwards the ſame Day the Weight ſtretch'd out the Rope again as much as formerly.

'Tis obſervable, that though *Morocco* be an Inland-Town, and the Soil of thoſe Parts be uſually dry, if not parched; yet Doctor *D.* who was lately there, informed me, that about *Morocco*, notwithſtanding the violent Heats he felt in the Day-time, he obſerved the Nocturnal Air to be very damp, ſo as to make the Clothes he put off at Night exceeding moiſt, and unfit to be worn without airing the next Morning. He added, That though the Air was very piercing, and manifeſted it ſelf to be ſo by many other Signs, yet it would not make his Knife ruſt in his Pocket, or his Sword in the Scabbard, though it would quickly produce a Ruſt in Inſtruments of that Metal expoſed naked to it.

Air too moiſt cannot be wholeſome. The Air in our Parts, *viz.* about *Oakly* in *Buckingham-ſhire*, though a high Country, is, as I ſaid before, between *Michaelmas* and *Alhallontide* very moiſt, eſpecially in rainy Weather, and upon a Thaw, inſomuch that Wainſcots, Stair-caſes and Pictures will ſtand all of a Water, and after run down in great Drops; and at *Brill*, upon that high Hill, 'tis in divers Houſes worſe than in the Valley, inſomuch that the Stair-caſes, eſpecially if laid in Oil, will run down with Water: the North and North-Eaſt ſide of our Houſes are obſerved to be moiſter, inſomuch that the Furniture will rot, if Fires be not made ſometimes in the Rooms, and the things aired: This is obſerv'd to be the moſt aguiſh Seaſon of the Year. Mr. *J. T.*

As in another Experiment we tried, whether or no the Removal of the Air out of the Receiver would much alter the Temperature of the included Medium or Space, as to Heat and Cold: ſo we indeavour'd to diſcover, whether the Alteration would be notable, as to Drineſs and Moiſture. To this purpoſe we did indeed wiſh for ſuch a Hygroſcope (or Inſtrument wherewith to meaſure the Moiſture and Drineſs of the Air) as we uſed many Years ago, and ſince found well deſcribed by the induſtrious *Kircher*, in a Place of his *Ars magnetica*, to which I therefore refer your Lordſhip. But in regard that to this Inſtrument there is requiſite the Beard of a wild Oat ſeaſonably gather'd, which we could not then procure; we recall'd to Mind another Hygroſcope, which, though it diſcover not ſuch ſmall Mutations as the former, we thought might be uſefully enough ſubſtituted inſtead of it.

Of this Hygroſcrope, having particularly deſcribed it in another Paper, we ſhall now only ſay in a word, that 'tis made by faſtning to the upper End of a Piece of Gut-ſtring, or great Luteſtring, a very light Index, and ſtrongly faſtning the lower end of the ſame String to the bottom of a Box, or other convenient Frame, the Circumference of whoſe upper Part may be at pleaſure divided into Degrees or other Partitions, upon which the Index may move to and fro. For the Inſtrument being thus made, when the Air grows moiſter, the Vapours inſinuating themſelves into the Pores of the Filaments that compoſe the String, do ſomewhat ſhorten it; and thereby thoſe Filaments being altered in point of Contortion, the Index that is faſtned to them turns one way: and upon the receſs of thoſe Vapours, or of others of like nature, the String comes to be wreath'd, and conſequently the Index to be moved another way. So that in a String of about three Inches long, the Point of the Index will be oftentimes made to change its Place very notably, by ſuch a mutation of the Air, as to Drineſs and Moiſture, as was to be met with in the Morning and at Noon of the ſame Day, tho ſuch a Change did not always need either Rain, Clouds or Miſts, or the abſence of them, to make it notable.

Experiment III. We took then one of theſe Hygroſcopes, and conveyed it into a ſmall Receiver, that the removal of the Air being ſudden, the Change of Temperature (if any ſhould happen) in the exhauſted Cavity, might be the more ſudden and conſpicuous. But we found not that the emptying of the Receiver made the Index ſenſibly change place. And though this Experiment were carefully made, yet for the greater Security we repeated it once more; and neither then perceiving the Index to remove, we kept the Receiver exhauſted for a pretty while, leſt there ſhould be ſome more time requiſite to the Operation of the Medium upon the Inſtrument. But neither did this Trial produce any ſenſible Alteration of the Index; but after the Key was turned, and Acceſs was thereby given to the excluded Air, tho the Cover were ſtill kept on, we found that then within ſome Hours, the Index was conſiderably removed. So that as far as theſe Experiments informed us, the Ether or ſubtile Matter that ſucceeds in the place deſerted by the Air, if that Place be not left void; and conſequently the thinner and more fluid part of the Atmoſphere (in which the Corpuſcles, that may be more properly called Aerial, ſwim) ſeems in its own nature to be very ſenſibly, neither cold, or hot, or dry, or moiſt. I ſaid, as far as theſe Experiments, I mean thoſe we made in this Engine with the Thermoſcope and Hygroſcope, inform us: becauſe this Conjecture (for I dare yet call it no more) may be examined divers other ways, whoſe Events may either confirm, or oppoſe, or limit it. In the mean time I could wiſh, that if your Lordſhip had one of *Kircher*'s Hygroſcopes at hand, you would frequently and carefully try the laſt-recited Experiment with it; becauſe I have found, that if ſuch a Hygroſcope be very well made, 'tis admirable, as well as pleaſant, to ſee how ſmall a Mutation of the neighbouring Air it will take notice of. But I thought fit to deſire to have it frequently tried, becauſe Care muſt be taken that ſuch Motions of the Index be not miſtaken for the Effects of the altered Temper of the Medium in the Receiver, which may in ſome Caſes proceed from thoſe Steams of the Oil and Water, which we elſewhere mention, that we now and then, tho but ſeldom, obſerved to get out of the Cylinder into the Receiver, and play up and down there.

TITLE IX.

Of Clouds, Miſts *and* Fogs.

HEaring that an excellent Aſtronomer of my Acquaintance, had often meaſured the Height of Clouds, I enquired of him what Height he obſerv'd them to have? and was anſwered, That though he had meaſured eighteen or twenty even of white Clouds in fair Weather, yet he obſerved ſcarce any one to be higher than three quarters of a Mile, and few of them he found to exceed half a Mile.

A Miſt coming, driving upon the Sea towards the Shoar, though without any ſenſible Wind, will raiſe a greater Swell of a Sea, than a briſk Wind will do. *N.*

I have obſerved in a Ground near my Houſe, which is ſomewhat moiſt in Winter, as alſo in other Places, eſpecially after a warm Day, and againſt fair Weather in *Autumn*, a moiſt blewiſh Miſt to aſcend about twenty or thirty Foot high, and then to ſubſide again in Dew. Mr. *J. T.*

TITLE X.

Of Terreſtrial Steams *in the Air.*

INquiring of an ingenious Acquaintance of mine, who, in an incloſed Scope of Ground, has ſeveral Veins of differing Metals and Minerals, whether he did not ſee, and ſometimes ſmell Steams aſcending out of this or that Spot of his Ground, in Circumſtances where their Aſcenſion could not be imputed to the Action of the Sun? He and his Son, who was alſo a *Virtuoſo*, told me, that they had divers times ſeen as 'twere Pillars of Fumes aſcending like Smoak, whereof ſome would be inodorous, ſome ill-ſcented, and ſome, though but ſeldom, well-ſcented. And you may have obſerved, as well as I, that Fogs, ſome of which I have known to be very laſting, and to have a large Spread, did require no tender Noſtrils to perceive them to ſtink.

I have frequently obſerved the ſmoaking Steams that aroſe out of the Shafts of Mines not wrought in: And it is certain, the Charcoal made in *Cornwal* (eſpecially of that Wood that grows in the Mineral Part thereof) doth afford a manifeſt Arſenical and Sulphureous Smell beyond other Charcoal. *N.*

Journal des Scavans III. 1685.

Tel eſt par exemple ce nuage horrible d'une fumée epaiſſe qui ſ'eleva de la mer de Crete au Commencement de l'Eſte de l'an 721. et qui ſ'etant repandu dans

l'air le fit paroiſtre tout en feu. La mer n'en fut pas meſme exempte ; car les groſſes maſſes de pierres enflammées qu'on en vit ſortier, et qui ſe joignirent a l'Iſle qu'on nomme Hiera, échauferent ſi fort les eaux qu'elles en bruloient les mains.

TITLE

TITLE XI.

Of Salts *in the Air.*

'TIS ſufficiently known that the Peripatetick Schools teach the Air to be an Element warm and moiſt; and if it be an Element, it ought, according to their Principles, and thoſe of the greateſt part of other Naturaliſts, to be a ſimple and Homogeneous Body. But becauſe ſuch an elementary or uniform Purity is much eaſier to be found in the Writings of Schoolmen, than amongſt the Works of Nature, many of the modern Philoſophers have juſtly forſaken this Doctrine of the elementary Simplicity of the Air in ſome meaſure; but perhaps very few of them, if any, have aſſerted the Air to be ſo exceedingly compounded a Body, as in my Opinion it really is. For divers of them grant indeed, that the Atmoſphere is not abſolutely pure, but yet think, that it differs but gradually from true and ſimple Air, as Water a little moved and troubled does from clear and ſettled Water. But for my part, I confeſs I acquieſce not in either of thoſe Notions of the Air. For, as I have elſewhere more fully declared in a ſhort Diſcourſe, purpoſely treating of the Subſtance of the Air, although I will not deny that there is an Ethereal Matter more ſubtile than the common Air, which Ether I take to be diffuſed through all the Interſtellar Part of the Univerſe known to us, reaching to and ſurrounding all its great Globles; yet ſpeaking of the Air which we Men live and breath in, I take our

Atmoſphere to conſiſt not only of the purer Ether, but in great part of a vaſt multitude of *Effluvia* emitted by the Terraqueous Globe, and the various Bodies it is made up of, and perhaps in ſome part alſo of ſubſtantial Emanations from the Celeſtial Bodies; and that that whereby the Atmoſphere differs from ſuch pure Air, as the Schools tell us of, is not a bare and indeterminate Feculency, but a confuſed Aggregate of ſeveral diſtinct and perhaps diſagreeing kinds of *Effluvia*. And amongſt thoſe, one of the principal ſorts I take to be the *Saline ones*, which rove up and down amongſt others in that vaſt Ocean of Effluxions, we call the Atmoſphere: wherein yet I do not think there are to be met with, either all ſorts of them every where, or perhaps any ſort in like Plenty, in all Places, and at all Seaſons.

To ſhew that the Air is not unfurniſhed with Parts of a ſaline Nature, I might alledg ſome Conſiderations that ſeem to make it probable *à priori*, as they ſpeak, that there are always ſome ſuch Corpuſcles emitted into the Air. But inſtead of inſiſting on ſuch Particulars, becauſe they may ſeem too little of an Hiſtorical Nature, to be fit for this Paper, I ſhall content my ſelf to take notice in the general, that almoſt (if not more than almoſt) all the Arguments I have employed, to prove the copious Aſcenſion of ſubterraneal Steams into the Air, may be applied to our preſent Purpoſe, ſince amongſt the *effluviating* Subſtances of the Terraqueous Globe, there are, as I have declared in another Paper, huge quantities of common or Marine Salt, beſides Nitrous, Aluminous, Vitriolate, and perhaps other kinds of Salts. To which I ſhall add, that the emiſſion of Subterraneal Aporrheas or Effluxes, is not the only Means whereby the Air may be impregnated with ſaline Particles; ſince the Exhalations and Vapours produced by the Action of the Sun-beams upon the more ſuperficial Parts of the Earth and Sea, may ſupply the Air with Swarms of Corpuſcles, as well of ſaline, as of any other Nature. Not to mention that the Number of theſe may, in divers Places, be much increaſed, by thoſe Vulcans, that have open Vents to diſcharge their Fumes into the Air; by thoſe numerous Fires which burning in our Chimnies, produce much ſaline Smoak; and by other ways, which I ſhall here forbear to diſcourſe of, for the Reaſon lately given for my declining Arguments drawn *à priori*: though ſome things applicable to this purpoſe, will in likelihood occur amongſt the Inſtances I am about to add, to make it ſeem probable *à poſteriori*, or by ſome Effects and Phenomena, that the Air is impregnated with ſaline Corpuſcles, that are none of its leaſt active Parts, and may have great Intereſt in divers of its Operations.

From what has been hitherto delivered, to make it probable that there is a ſaline Subſtance in the Air, I thought fit to proceed to other Inquiries. The firſt; Whether the Aerial Salts be of differing kind? and if ſo, which they are? And the ſecond; How it comes by its ſaline Subſtance? But about ſuch differing Points I durſt promiſe *my ſelf* but little Satisfaction, and therefore ſhall not pretend to give *you* much.

And yet, to ſay ſomething to the firſt of the two Inquiries, I am prone to think, that the ſaline Particles of the Atmoſphere are not all of one ſort, but that there may be three or four differing kinds of Aerial Salts.

I know that divers learned Men, ſome Phyſicians, ſome Chymiſts, and ſome alſo Philoſophers, ſpeak much of a *Volatile Nitre*, that abounds in the Air, as if that were the only Salt wherewith it is impregnated. But though I agree with them, in thinking that the Air is in many Places impregnated with Corpuſcles of a Nitrous Nature; yet I confeſs I have not been hitherto convinc'd of all that is wont to be delivered about the Plenty and Quality of the Nitre in the Air: For I have not found, that thoſe that build ſo much upon this volatile Nitre, have made out by any competent Experiment, that there is ſuch a volatile Nitre abounding in the Air. For having often dealt with Salt-peter in the Fire, I do not find it eaſy to be raiſed by a gentle Heat; and when by a ſtronger Fire, we diſtil it in cloſe Veſſels, 'tis plain that what the Chymiſts call *Spirit of Nitre*, has quite differing Properties from crude Nitre, and from thoſe that are aſcribed to the volatile Nitre of the Air; theſe Spirits being ſo far from being refreſhing to the Nature of Animals, that they are exceeding corroſive: And even when I cauſed Earth to be dug up in an old Pigeon-Houſe, becauſe that is accounted the moſt nitrous ſort of Earth, and diſtill'd it with moderate Fires, I did not find the volatile ſaline Parts, that came over, to be like that, which theſe learned Men conceive the Air to be ſtored with. Nor have I met with among them any poſitive Proof, to evince the Truth of their Opinion; which yet, as I was ſaying, I am content to admit as an ingenious Suppoſition, 'till ſomething be offered that ſhall prove it to be more; which I think not impoſſible to happen, at leaſt as to ſome Times and Places. But I am not yet ſure, that the Exhalations, that aſcend from the ſubterraneal Parts, and perhaps alſo the Sun-Beams themſelves, may volatilize many of the nitrous Corpuſcles they chance to act upon, and elevate them into the Air, without analyzing them, or deſtroying their Texture, as our Fires are wont to do. But however, I do not take the hitherto mention'd Nitre to be the only Salt, that impregnates the Air: For when I conſider how vaſt a Portion of the Terraqueous Globe is cover'd with the ſalt Sea, and how vaſt Quantities of foſſile Salt, as well fine and clear, as courſe, are dug up in *Poland*, eſpecially near *Cracovia*; in *Hungary*, *Tranſylvania*, and in divers other Parts of the Earth: When I conſider too, that we ſeldom find Salt-peter in the Earth, but that there is Sea-Salt mix'd with it, which puts the Salt-peter-men to a great deal of Trouble to ſeparate it; and that even from Salt-peter, that paſſes for good, I had Trouble enough, when I had the Curioſity purpoſely to refine it, to free the purely Nitrous from the other ſaline Particles: I am prone to ſuſpect, that in very many Places, eſpecially maritime ones, the *Effluvia* of common Salt do, at leaſt as plentifully as thoſe of Salt-peter, abound in, or impregnate the Air: which Conjecture might be favoured by divers things, if I had leiſure to inſiſt on them.

That in ſome Places, that abound with Marchaſites, there is a kind of fretting Vitriolate Salt, copiouſly diſperſed through the Air, I have been inclin'd to think, partly by other Inducements, and partly by the Anſwers made me by a very obſerving Man, who liv'd in a Place, that I remember I viſited; where being forced to reſide a good while, he found the Hangings of his Chamber, and the Curtains of his Bed, rotted by the Vitriolate Steams expir'd by the Soil, whoſe *Effluvia* had alſo very manifeſt and unwelcome Effects, on divers other things, that were kept near that Place; tho on the oppoſite Side of the River, in a Town that is not half a Mile diſtant from this Place, neither I, at my being there, heard any ſuch thing complain'd of, nor the Relator, who had often occaſion to repair thither, obſerv'd any ſuch miſchievous Effects; the Soil of this latter Place being chalky; whereas the other above mentioned is vitriolate, inſomuch that he obſerv'd, that when the moiſt and blackiſh Mould had been beaten upon by the Sun, that here and there the ſuperficial Parts would be as 'twere beſprinkled with a ſomewhat whitiſh ſaline Efflореſcence.

Beſides the hitherto-mention'd kinds of Salts, it ſeems not improbable to me, that the Air (eſpecially about great Towns, and ſome other particular Places) may be impregnated with volatile Salts, that are of a Nature contrary to Acids. For that there may be Places in the Earth, even at a good Depth under Ground, that lodg ſuch Salts, I have been induced to think by the Experience of an Acquaintance of mine: who, hoping to find in the Salt of what he ſuppoſed to be Virgin-Earth, the true Receptacle of an univerſal Spirit, from which he promiſed himſelf great and profitable Matters, cauſed to be dug up a great deal of a certain Clay, in a Place abounding with Minerals, and obtain'd thence by mere Diſtillation, no inconſiderable Quantities of Spirit and Salt, which in divers Qualities, as Smell, Taſte, *&c.* I judg'd to be near of kin to the Spirit of Urine or Hartſhorn. And yet this Earth was dug up at the Depth of many Feet, not to ſay Yards, beneath the Surface of the Ground, (as an ingenious Potter, from whom the Chymiſt had the Clay, aſſur'd me upon the Place it ſelf) which I once viſited, to ſee ſome other choice Minerals, that innobled that Soil; whence I would have got a Quantity of the above-mentioned Clay, but that it being then the midſt of Winter, the Rain had (as the Workmen ſpeak) drowned the Pit.

In great Cities, and alſo Towns, where much Wood is burnt, 'tis probable that numerous Particles of volatile Salt may be diſperſed through the neighbouring

Air. For, as I have elſewhere ſhewn, the Soot of burn'd Wood, which is but that ſmall part of the Smoak which chances in its paſſage upwards to ſtick to the Chimny, does very much abound in a volatile ſaline Spirit, which by many Trials are found to have ſo much Affinity to that of Urine and of Hartſhorn, as not to be eaſily, but by the Smell diſtinguiſhed from it.

Beſides, in ſeveral Places the Putrefaction of Subſtances, that once were Parts of animal Bodies, may furniſh the Air with volatile Salts, as I have elſewhere mentioned, that I found, that Urine, without Diſtillation, will by bare Putrefaction afford ſaline and ſpirituous Parts, that, whilſt they yet ſwim in the copious Phlegm, that makes up the Body of the Liquor, will manifeſtly diſcover themſelves to be volatile, not only by their Smell, but by their hiſſing with acid Spirits, and by their diſſolving ſome Bodies, and precipitating others, according to the manner of volatile ſulphureous Salts, as thoſe that abound in Spirit of Hartſhorn, Blood, *&c.* And I am apt to think, that 'tis not only in the parts of Animals, but alſo in thoſe of many Vegetables, that Putrefaction may either extricate or produce volatile Salts. And I remember, I have obſerv'd in ſome ſucculent Vegetables, that chancing to lie in a Heap together, in a convenient Seaſon of the Year, to make them rot; I obſerv'd, I ſay, when the Putrefaction was come to a certain Point, that the Stink did ſo reſemble that of Carrion, that 'twas not eaſy for me to believe it came from Cadaverous Plants, not Animals. And that 'tis not impoſſible for a Vegetable to afford, without the Help of an Additament, a volatile Salt, even *in forma ſicca*, may be gathered from what I elſewhere relate, of my having diſtill'd ſuch a Salt from a certain ſpirituous Seed, though I freely confeſs, I never obtained any (without previous Incineration) from above two or three Vegetables. But of this enough in this Place.

I ſhall now add, that beſides the more ſimple Salts hitherto enumerated, 'tis not unlikely, that in ſome Places the Air may ſometimes contain compounded Salts. For I have elſewhere ſhewn, that ſome ſorts of ſaline Spirits, meeting one another in the Air, may there convene. And I elſewhere teach how to order a couple of Liquors ſo, that one will never of it ſelf afford any thing in a dry form; and yet the ſpirituous *Effluvia* of this Liquor, meeting with thoſe of the other, will exhibite a volatile and ſaline Body in a dry form; though the Liquors themſelves being mingled, will not afford any ſuch Subſtance. What I have elſewhere delivered concerning ſubterraneal Steams, may make it probable, that at leaſt now and then, and in ſome Places, there may be ſent up from under Ground into the Air, among other *Effluvia*, ſtore of ſaline ones, which needs not be ſuppoſed all of them to be of an uncompounded Nature. With which that agrees very well, that was related to me by a very intelligent Acquaintance of mine, that liv'd long in Parts of *America*, where there was a *Vulcan*, which he and ſome others having the Curioſity to viſit, told me, that before they came any thing near the Fire, or were offended by the Heat, not only the Skin of his Face was almoſt corroded by the Sharpneſs of the Exhalations, but the Colour of his Hair was alter'd by it; which kept him from proſecuting his intended Diſcovery. 'Tis a known thing, and I have received Information of it from more than one Eye-witneſs, that about *Mount Veſuvius*, the aſcending Exhalations, that iſſue out at ſome of the Holes, are of ſo ſaline and ſulphureous a Nature, that part of them ſtick about the Orifices of thoſe Vents, in the form of Flower of Brimſtone; of which a learned Acquaintance of mine brought away ſome Quantity. And I have had brought me from ſome of thoſe Vulcans, a Stone, whoſe Caveties abounded with a white Salt, which, by fit Trials purpoſely made, was found near a-kin to *Sal-Armoniac*, and eaſily reſoluble into a Salt, whereof one part was ſomewhat fix'd, and the other very volatile, which made it highly probable, that the Salt was compounded in the Bowels of the Vulcan: whence I have been credibly inform'd, that great Quantities of it have been caſt up in the fiery Eruptions, and therefore Store of it might in Likelihood be diſperſed through the Air, ſince I found the Salt it ſelf to be ſublimable.

But, beſides the ſaline Subſtances hitherto mention'd, which may be referr'd to determinate *Species*, I think it not impoſſible, that the Air may, at leaſt in ſome Times and Places, be impregnated with Corpuſcles of a ſaline Nature, whether ſimple, or compounded, or of both kinds, not eaſily reducible to any of the ſorts, we have been ſpeaking of, or are acquainted with. For which Reaſon I ſhall not preſume to give them any other Denomination, than that indefinite one of *Anonymous*. And I have been inclin'd to think, there may be ſuch Bodies in the Air, by theſe two Inducements. The firſt; That the particular aerial Salts, that have been hitherto recited, are but few, as it ſeems probable, by what I have ſaid in other Papers of ſubterraneal Steams and *Menſtruments*; and that therefore there may aſcend out of the Earth into the Air, ſaline Fumes differing enough from thoſe, whoſe kinds we have hitherto deſcrib'd. But beſides this Conſideration *à priori*, (as they ſpeak) Experience has preſented us with ſome *Phenomena*, that

ſeem

ſeems *à poſteriori* to confirm this Conjecture. For there happen ſuch Changes to ſome Bodies, by being expoſed to the Air, as, though I am not ſure, and therefore ſhall not be confident, that they are mainly produc'd by ſome nameleſs Subſtance of a ſaline Nature, may yet make it allowable to ſuſpect them to proceed thence. And amongſt theſe I ſhall take leave to inſert ſome, which I deny not to be probably referrable, either to one or other of the formerly enumerated kinds of aerial Saltneſs. For laying theſe Inſtances before you together, they may, by appearing thus aſſociated, give the ſtronger Probability to our Opinion, that there are ſaline Subſtances in the Air. And thoſe Inſtances, that are not ſo proper to perſwade you, that there are anonymous Salts, may ſerve to confirm that there are, at leaſt in divers Places, differing ſorts of aerial Salts. I remember I have more than once viſited old Glaſs-windows, in high and ancient Buildings, and found ſome of the Panes of Glaſs here and there corroded, as if they had been worm-eaten; which probably enough argued the ſharp and fretting Corpuſcles, to have been carried along with the Winds to which they were expoſed, as will not eaſily be reduced to any formerly nam'd Salts, whoſe being unable to corrode Glaſs, eſpecially no finer than that was I ſpeak of, is ſufficiently known to Chymiſts.

Beſides the above-mention'd *Phenomena*, others have occurr'd to me, which poſſibly 'twould not be thought impertinent to ſubjoin on this occaſion; but I chuſe rather to reſerve them for another Diſcourſe; and now ſhould put an End to this, but that I dare not conceal from you, that I ſometimes had Thoughts of trying, whether a Diſcovery may not be made, what kind of Saltneſs there is to be found in the Air, and whether the aerial Saltneſs does or does not abound there, at leaſt at this or that time. But this I freely confeſs to be ſo difficult an Attempt, that all that I can offer pretends but to diſſwade you from rejecting it, as too deſperate and extravagant a thing to be fit to be tried.

And I ſpeak the leſs promiſingly of what I am to ſay in the remaining part of this Paper, becauſe I have not by me any Notes to aſſiſt my Memory, (which I dare not truſt alone) concerning the Iſſues of the not numerous Trials, I had Opportunity to attempt in purſuance of thoſe Thoughts. This I well remember, that among other ways of making the intended aerial Diſcoveries, I look'd upon this as the leaſt unpromiſing, that ſuch Subjects ſhould be carefully choſen out, as being diſpoſed to be differingly wrought upon, according to the differing ſorts of Saltneſs, that may be found predominant in the Air.

This more general way of inveſtigating the Salts of the Air, may contain divers particular Methods, of which I ſhall now touch upon the following three.

Firſt, It may be worth while, to expoſe to the Air ſuch Bodies, as we judg fitteſt to be wrought upon by the Salt, that we think likelieſt to be met with in it. So where we gueſs the Air to be impregnated with Nitre, we may expoſe Lime to it, or ſome other Body that we think diſpoſed to imbibe or retain ſuch a Saltneſs. We may alſo hang up in ſuch an Air, Clothes or Silks died with ſuch Colours, that Nitrous (for Inſtance) or Salino-Sulphureous Spirits (as ſome Chymiſts call them) have been found peculiarly apt to make to fade, or to diſcolour them. In the Places where we ſuſpect vitriolate Steams to abound, ſome appropriated Preparations of *Sulphur*, either common or metalline, may be expoſed to try whether they will acquire a Blackneſs,

neſs, as I have ſeveral times found ſome of thoſe Sulphurs, though otherwiſe of no dark Colour, to do, upon the leaſt Contact of vitriolate Corpuſcles. In ſome Places alſo, which are judg'd likely to afford ſubterraneal Steams, gueſſes may be made, whether this or that kind of Salt aſcends into the Air, by ſpreading upon the Ground, in Places free from Dirt and Duſts, large Pieces of clean and white Linen Cloth, that has no Reliſh of Sope or Lees; and obſerving, after they have lain a competent while, whether, and how they are diſcoloured, and what kind of Saltneſs, if any, is to be found in the Moiſture imbib'd by them, from the aſcending Steams and falling Dew.

The next of the above-mention'd ways of inquirng after the Saltneſs of the Air, may be, to find, if it be poſſible, ſome one Body, that is both capable to be wrought on by ſeveral aerial Salts, and will be ſo differingly wrought on by them, as to diſcover which kind of Salt it is, that has produc'd the Change. That 'tis very difficult to find ſuch a Body, I will readily grant, but that it may be poſſible I will not be forward to deny. For having pitch'd upon Copper to make this Trial with, though the Attempt did not ſucceed according to my Wiſh, yet perhaps it was chiefly for want of Time and Accommodations that it miſcarried. For having taken Plates of Copper beaten thin, (without regarding their Bigneſs, or Figure, or Smoothneſs, as things not neceſſary to my purpoſe) I cauſed the Surfaces to be made very clean, that the Colours might be the more eaſily produced, and the better diſcerned; then, keeping theſe over Glaſſes wherein were placed divers Spirits, as of common Salt, and of Nitre, partly ſincere, and partly diluted with Water, I obſerv'd, as I expected, that though I put the Glaſſes in no Heat, yet there

Experiment I.

there aſcended fretting Particles out of the Liquors, and that within leſs than a Day, the Steams of the two above-mention'd Liquors had much darken'd the Surfaces of the Copper Plates, they met with in their way, the keeping them a while in the Air was not hard to know by the differing Diſcolorations that appear'd, which Plate had been invaded by the ſaline Corpuſcles, and which by the nitrous: Which I did not at all wonder at, becauſe I have formerly found, as I have elſewhere noted, that whereas Spirit of Nitre will make of Copper a greeniſh blew Solution, Spirit of Salt will, if duly imployed, diſſolve that Metal into a graſs-green Liquor; as the Spirit of Soot and that of Urine will into a deep Blew, almoſt like Ultramarine. But, as I ſaid, the want of Time, of which good ſtore may be requiſite for ſuch Trials, kept me from proſecuting my Attempt to an Iſſue. Notwithſtanding which I look not upon the Deſign as deſperate, not only becauſe of the Incouragement I have already mention'd to reſume it: But becauſe I have obſerv'd Pieces of malleable Copper, brought me, to examine, out of an Engliſh Mine, (which is yet conceal'd) to be overcaſt here and there with a fair Verdigreaſe, which by Circumſtances I judg'd to have been produc'd, not by groſs Liquors, but by the Air impregnated with Steams fit to work on that Metal. And poſſibly there may be other ſubterraneal Bodies, and even metalline ones, that by their Degree of Colour, or peculiar kind of Ruſt or Stain, that they will acquire in the Air, may help us to gueſs, what Subſtances, and among others what Salts the Air of that Place is impregnated with. I have been in a great and ſtately Houſe, which being oddly ſeated, had this peculiar Inconvenience, upon the Score of the Steams that infeſted the Air, that thoſe that dwelt in it, as one of the chief of themſelves complained to me, could not keep their Silver Plate, of which they had great Store, from being blemiſhed by odd Diſcolorations, or as they ſeem'd to think it, Ruſt; though when it was not uſed, they carefully kept it in a Place judg'd convenient for ſuch a Purpoſe. And I have been informed by an obſerving Man who liv'd there ſome time, that there is nothing more generally known in *Amſterdam*, than that their Silver Plate there, expoſed a little while to the common Air, tarniſhes immediately, contracting a dirty Colour, partaking of yellow and black. Another Inſtance or two, though not afforded by Plate, I could mention to the ſame Purpoſe; but I reſerve them for another Place; my Haſte obliging me to paſs on to the laſt of the three ways I propoſed, of inveſtigating the Differences of aerial Salts.

The third way may be look'd upon, if you pleaſe, as a Variation of the ſecond; but there is this Difference betwixt them, that here we make uſe of metalline Bodies, not crude, but already prepared by ſome Chymical Operations; ſo that being before-hand reduc'd to very ſmall Parts, by the Intervention of ſaline Subſtances, the Operation of the Air upon them is wont to be much the ſooner performed. In this third way then we imploy ſuch factititious Minerals or other Bodies, as having for the moſt Part an adventitious Colour already, will change that Colour by being expoſed to the Air. For it ſeems not impoſſible, but that by diligently obſerving what Difference may be found in the Diſcolorations, produc'd in theſe Subſtances by the differing kinds of Salts, as Nitrous, Salino-Sulphureous, *&c.* that we have ſhewn may be met with in the Air, ſome gueſſes may be made in a ſhort time of this or that Salt, which has the chief Stroak in the Production of the exhibited Colour. And I ſhall on this occaſion mention two or three Bodies, without determining, till I be better ſatisfied, whether their Changes proceed only or chiefly from the Salt of the Air; but I am content not to pretermit them, becauſe if they do not prove what I propoſe, they will at leaſt clear the meaning of it, and may however help us to gueſs at the Reſemblance or Difference of Airs in ſeveral Places, by the Likeneſs or Unlikeneſs of the produc'd Changes of Colour, whether theſe Changes proceed from ſaline, or from any other Subſtance intermingled with the Air.

Experiment II.

If we precipitate a ſtrong Solution of good Silver made in *Aqua fortis*, with a competent Quantity of Spirit of Sea-Salt, we ſhall have a Pouder, which at firſt will be very white; but if the Liquor be not poured off, this being expoſed for a good while to the Air, it would acquire on the Surface a dark Colour, which perhaps an attentive Eye will diſcern ſomewhat various, as this or that kind of Saltneſs happens to be predominant in the Air.

Experiment III.

We took an equal Weight of good Filings of Copper, and pouder'd Sal-Armoniac, which being well mix'd, were put into a cover'd Crucible, and kept in a moderate Fire over ignited Coals, till the Sal-Armoniac had either quite or almoſt done ſmoaking; then as much of the remaining Maſs as could be parted, was taken out, and look'd of a dark Colour; but this Maſs being groſly beaten, and expoſed for ſome time to the Air, look'd like a kind of Verdigreaſe, which is a Subſtance, whoſe Colour may be obſerv'd ſomewhat to vary, according to the Nature of the particular Salts, which by working on, and imbodying with the Copper, produce the Pigment. But a Parcel of the ſame Maſs being, before the Air had time to work much upon it, groſly pouder'd, der'd, and hermetically ſeal'd in a glaſs Egg, to fence it from the Air, and left in a South Window, did not appear diſcoloured, when the out-ſide of the other Parcel ſhew'd like Verdigreaſe: which ſeems to argue, the Change of Colour to have been made by the aerial Salt, if we ſuppoſe the Moiſture of the Air to have had no Intereſt in the Change, or to have concurr'd to it, but as a kind of Vehicle aſſiſtent to the Salt.

Experiment IV. I alſo took Spirit of the Soot of Wood, and having poured a little of it on the Filings of Copper, my Expectations were anſwer'd by my finding, that the Liquor diſſolved ſome Parts of the Metal into a deep and lovely Azur like Ultramarine; and that this Solution being ſuffer'd to grow dry in an open Glaſs, by the the mere Operation of the Air, the *Ceruleous* Colour very ſoon degenerated, even before the matter was quite dry, into a *Cyanious* Colour, ſuch as may be ſeen in good Turquoiſes. And to manifeſt that this Change proceeded not from any Peculiarity in the Spirit of Soot, and that this Spirit acted as abounding with a Salino-ſulphureous Salt; I ſhall add, that I had the like Succeſs in a Trial made with an urinous Spirit drawn from animal Subſtances, and put upon crude Filings of Copper. And in thoſe Trials I ſometimes obſerv'd the Differences of Colours, that did not diſcourage me from hoping, that the Proſecution of them might not be inſignificant to my Purpoſe.

I have not been ſolicitous to deſcribe the fore-mention'd Changes of Colours more particularly, becauſe it had been very difficult to do ſo, and therefore I judg'd it more expedient not to attempt it. For there is ſo great a Variety of Colours, that few but Painters can exactly enumerate, and diſtinguiſh them by proper Names. And yet, beſides thoſe more noted ones, there are many others, for which, though our Language, nor perhaps any other, is not copious enough to furniſh us with diſtinct Appellations, yet our Eyes, eſpecially when they have been attentively converſant with ſuch Objects, are ſharp enough to diſcern them: and by the Help of theſe nameleſs, as well as the ſtated Colours, I am apt to think a heedful Obſerver may perceive divers Variations in the Colours of the Bodies, we have been ſpeaking of, that may aſſiſt him to gueſs, what Subſtance it is in the Air whereto theſe Diverſities may be aſcribed. And as Nature is much more rich in Things, than our Dictionaries are in Words, ſo has ſhe furniſhed Men with Senſories capable of diſtinctly perceiving a far greater Variety of Objects, than they are able verbally to expreſs. And this might be ſhewn by Inſtances, in the Organs and Objects of Senſes leſs acute than Sight, whoſe Subtilty in diſtinguiſhing things I could exemplify, not only by what is related, but by what has been perform'd by ſome Perſons, not unknown to me, particularly our famous Doctor *Harvey*. But Examples of this kind I have not leiſure to ſtay on; and therefore without ſpending more Words upon this third way of diſcovering aerial Salts, I ſhall barely recommend the Care of ſuch Obſervations to their Curioſity, who ſhall think it worth while to make them.

With how little Confidence of Succeſs, Trials that have the Aims of thoſe I have been ſpeaking of, are to be attempted, not only Conſideration, but Experience hath made me ſenſible. But yet I would not diſcourage humane Curioſity from adventuring even upon ſlight Probabilities, where the Nobleneſs of the Subjects and Scope may make even ſmall Attainments very deſirable. Thoſe adventurous Navigators that have made Voyages for Diſcovery in unknown Seas, when they firſt diſcern'd ſomething of obſcure near the Horizon, at a great Diſtance off, have often doubted, whether, what they had ſo imperfect a Sight of, were a Cloud, or an Iſland, or a Mountain: But though uſually it were more likely to be the former, (as that which more frequently occurr'd than the latter) yet they judg'd it adviſable to ſtere towards it, till they had attained a clearer Proſpect of it: For if it were a deluding Meteor, they would not however ſuſtain ſuch a Loſs in that of no great Labour, as in caſe it were a Country, they would in the Loſs of what might prove a noble and rich Diſcovery. And if they deſiſted too ſoon from their Curioſity, they could not rationally ſatisfy themſelves, whether they ſlighted a Cloud, or neglected a Country.

I do not perceive that the Air of our Inland Parts is conſiderably impregnated with Eſurine Salt; ſince I do not find the Barrs and Caſements of our Windows much impaired by Ruſt after near eighty Years ſtanding; or that they are more ruſty towards one Quarter than another; though the Air hereabout (viz. *Oakly* in *Buckingham-ſhire*) is very damp about the End of Autumn, and Beginning of Winter. So that I conceive this Salt either proceeds from the Sea-Vapours near the Sea-Coaſts, or elſe from the Diſſolution of this Eſurine Salt in the Air, upon the burning of Sea or other mineral Coles. Mr. *J. T.*

Agricola de Re Metallicâ, Lib. duodec.

Mox ollam ex igni removent; poſtea ex refrigerata eximunt halinitrum puriſſimum: quod candidi marmoris ſpeciem gerit; atque tunc etiam id quod terrenum eſt, in fundo reſidet. At terra, ex qua dilutum fuit factum, & rami quernei vel conſimilis arboris alternis ſub dio ponantur, & aqua quæ combibit halinitrum conſpergantur:

ſpergantur : quò modo quinque vel ſex annis rurſus apta fit ad conficiendum dilutum. Halinitrum quodammodo purum, quod dum terra tot annos quievit interea, ortum fuit, & quod lapidei parietes in cellis vinariis & locis opacis exudant, cum primo diluto permiſtum decoquatur.

Si verò locus aliquis talium venarum copiam ſuppeditaverit, ipſæ ſtatim non conjiciantur in caſtella ; ſed primo convehantur in areas, atque cumulentur : quanto enim diutius aeri & pluviis expoſitæ fuerint tanto meliores fiunt. Nam in ejuſmodi cumulis, aliquot poſt menſibus, quam venæ in areas fuerunt congeſtæ, naſcuntur fibræ longe venis bonitate præſtantes : deinde vehantur in ſex, plurave caſtella, longa & lata ad novem pedes, ad quinque alta.

Si verò dum dilutum recoquitur, ſeparata non fuerint, mox ex minoribus vaſis infundatur in majora, eaque concludantur : in quibus item atramentum ſutorium ſeparatum ab alumine concreſcit : utrumque exciſum, & in hypocauſto ſiccatum divendatur dilutum, quod in vaſis & cupis non concrevit in cortinam refuſum recoquatur : ſed terra, quæ in fundo cujuſque cortinæ reſedit, ablata in caſtello unà cum venis, denuo aqua & urina diluatur. At terra quæ in caſtellis diluto, poſtquam effluxit, ſuperfuit egeſta & coacervata quotidiè, rurſus magis ac magis fit aluminoſa, non aliter atque terra, ex quâ halinitrum fuit confectum, ſuo ſucco plenior fit : quare denuo in caſtella conjicitur, & aquæ affuſæ ea percolantur.

A learned Obſerver, who practiſed Phyſick in one of the moſt Southern of the Engliſh Colonies, being ask'd

by me about the Effects of the Air there upon Iron; affirm'd to me, that the great Guns there are ſo ſubject to become ruſty, that after they have lain a very few Years in the Air, one may with a Hammer knock off whole Scales, or rather Cakes of *Crocus Martis*: and he obſerv'd, that thoſe Guns, that lay only expos'd to the Air, did this much more than thoſe that by Accidents were drown'd, and lay cover'd with the ſalt Water.

And ſince Dew is made of Steams of the Terreſtrial Globe, which whilſt they retain that Form, and were not yet convened into Drops, did ſwim to and fro in the Air, and made part of it; the *Phenomena* that ſhew the Power of Dew in working on ſolid Bodies, may help to manifeſt how copiouſly the Air may be impregnated with ſubtil ſaline Parts. Wherefore I ſhall here add, that having met with a Perſon that was bred as well a Scholar as a Traveller, and had viſited not only ſome of the maritine Places of *Braſil*, but ſome of the inward Parts of that vaſt Country, I inquired of him about the Subtilty of Braſilian Dew, and its Power to ruſt Metals, about which he told me, that it was certainly very great, and would not only ruſt Knives and ſuch Inſtruments, but likewiſe Money, which he aſſured me he had particularly obſerved; adding, that in ſeveral Places the Portugals kept their great Guns caſed over, that the Dew might not fall upon them, and by its Corroſiveneſs ſo ruſt them, as to be apt after a while to break in the Diſcharge. And when I demanded whether he taſted the Dew, to obſerve the Saltneſs of it? he replied, that he had not, but that he had in divers Places obſerv'd, that it left the Graſs, *&c.* that it had reſted on, cover'd over with a pure white Salt, as if it had been a hoar Froſt.

An ingenious Traveller, and Student of Phyſick, being diſcourſed with by me about ſome Particularities of his Country (which is *Sweedland*) relating to Minerals, and their Effects upon the Air, aſſured me, that in a City, or notable Town called *Fahlun*, which is built on the lower Part of an Hill, containing one of the beſt Copper Mines in *Sweden*, the Exhalations, that are copiouſly emitted by the latent Minerals, do ſo affect the Air in and about the Place, that their Silver Coins are oftentimes notably diſcolour'd by them, not ſeldom made even black or blackiſh, though the Money be kept well tied up in Bags or Purſes, and theſe perhaps placed one within another, and the whole Aggregate be kept lock'd up in Coffers or Preſſes made of Wood of perhaps an Inch thick: He added, that theſe ſubterraneal Steams have manifeſt Effects upon Braſs, (wherewith that Country abounds) inſomuch that there being kept in the principal Church ſeven Crowns made of that Metal upon a particular Occaſion, the ſulphureous Steams made thoſe that look'd to them, take the Pains to cleanſe and brighten them at a Months End, till finding that the Labour was every Month to begin again, they at length grew weary of it, and ſuffer'd theſe Crowns to grow, as they yet continue, as black (to uſe his own Phraſe) as the Tunnel of a Chimny: This he averr'd to be true, as having a good Opportunity to be ſure of it, in regard of his being a Native of this Town. And he further aſſured me, that the corroſive Exhalations did ſo penetrate the Bars and Veſſels of Iron that lie expoſed to the Air, that after a while, 'tis eaſy with a Hammer to knock off Scales of *Mars*, which are friable into a Pouder like *Crocus*, ſave that the Colour is more dark.

TITLE XII.

Of Sulphur, *and inflamable Particles in the Air; and of Lightning, and its Effect.*

YEſterday a Neopolitan Lord, a Perſon of high Quality, and very curious, being ask'd by me ſome Queſtions about ſome natural Phenomena relating to *Veſuvius* and the adjacent Country? aſſured me, that having had occaſion to ſtay for divers Months at a Country Houſe, but little diſtant from *Naples*, he took much Pleaſure, taking the Air on Horſe-back upon a very ſulphureous Soil, to take notice of divers Obſervables to be met with there; and that he often found, that when his Horſe trod ſomething hard upon the Ground, there would be produced a great, and as it were a crackling Noiſe, which would have frighted a Stranger; and that oftentimes he could diſcern, that where his Horſe had trod, there would preſently ariſe a Duſt, and Fumes that were manifeſtly ſulphureous and ready to take Fire: adding, that ſometimes he thought that they actually did ſo. He further told me, that he ſometimes for Curioſity ſake, cauſed ſome Clods, or as it were Turfs, to be cut out of that Soil, and laid in a kind of Heap, and that then in the Night he could obſerve, that the Steams that plentifully iſſued thence would ſometimes be kindled by or in the Air, as they aſcended in it.

The ſame Noble-Man told me, that when ſome Years ago there were Eruptions of Fire in *Mount Veſuvius*, he and others obſerv'd, with Amazement and Horror, that the Flame, which ſhot up into the Air from the *Volcano*, was of ſo prodigious a Height, as invited them to meaſure it with a Quadrant, by which they found it to be near two Miles high: And when I ask'd if he compriſed in that Height the Altitude of the Mountain it ſelf? he anſwered, that he did not, for the Flame that appear'd above the top of the Mountain, appear'd as high as the Mountain it ſelf; and 'twas from the top of the Hill, and not the bottom, that they computed the Height of the Flame. He added, that ſometimes the Earth would tremble, and there would be Diſcharges of ſuch vaſt Stones, and other heavy things, that he ſaw ſome Maſſis of ignited Matter thrown up a great way into the Air, that were bigger than the Chamber he did me the Honour to viſit me in, though that were a large Room for a Bed-chamber.

Voyage de Levant, p. 203.

Voila tout ce qu' on peut dire de cette Iſle, qui ſemble un enfer, car on voit la mer du port, & de la coſte toute noire & Brûlée d' un petit eſcueil, qui paroiſt depuis enuiron ſoixante ans, & d' ou on vit ſortir en ce temps lá une grande flamme, qui y a laiſſé une ouuerture ſi profonde, que ſi on y jette une pierre, on ne l' entend point tomber. Mais ce qui eſt arriué depuis en ce port, n' eſt pas moins eſtonnant, je le rapporteray icy comme je l' ay appris de diuerſes perſonnes en pluſieurs endroits. Il y a enuiron 18. ans que durant la nuit d' un certain Dimanche, commenca dans le port de Santorini un tres grand bruit lequel s' entendit juſques á Chio, qui en eſt eloigne de plus de deux cent milles, mais de telle ſorte qu' on crut à Chio que c' eſtoit l' ar-

Accident extraordinaire à Santorini.

mée Venitienne qui combattoit contre celle des Turcs, ce qui fit que dés le matin chacun monta aux lieux les plus éleuez pour en eſtre ſpectateur, & me ſouuiens que le Reverend Pere Bernard Superieur des Capucins de Chio, homme venerable, & tres digne de foy, me conta qu' il y avoit eſte trompé comme les autres, car il crut auſſi bien qu' eux entendre pluſieurs coups de canon ; cependant ils ne virent rien, & en effet ce fut un feu qui ſe prit dans la terre du fond du port de Santorini, & y fit un tel effet, que depuis le matin juſqu' au ſoir il ſortit du fond de la mer quantite de pierres de ponce, qui montoient en haut auec tant de roideur & tant de bruit, qu' on euſt dit que ce fuſſet autant de coups de canon, & cela infecta tellement l' air, que dans ladite Iſle de Santorini, il mourut quantité de perſonnes, & pluſieurs de la meſme Iſle en perdirent la veue, qu' ils recouurerent pourtant quelques jours apres. Cette infection s' eſtendit auſſi loin que le bruit qui l' avoit precede, car non ſeulement dans cette Iſle, mais meſme a Chio, & á Smyrne, tout l' argent deuint rouge, ſoit qu' il fut dans les Coffres, ou dans les poches ; & nos Religieux demeurans en ces lieux lá me dirent que tous leurs calices en eſtoient deuenus rouges. Au bout de quelques jours cette infection ſe diſſipa, & l' Argent reprit ſa premiere couleur. Ces pierres de ponce qui ſortirent de la couurirent tellement la mer de l' Archipel, que durant quelque temps, quand il regnoit de certains Vents, il y avoit des ports qui en eſtoient bouchez, en facon qu' il n' en pouuoit ſortir aucune barque, pour petite qu' elle fut, que ceux qui eſtoient dedans ne ſe fiſſent le chemin au travers de ces pierres de ponce auec quelques pieux ; & on en voit encor á preſent par toute la mer Mediterranée, mais en petite quantité, cela s' eſtant diſperſé ca & là. Seneque raconte en une de ſes Epiſtres

que Santorini eſt baſtie ſur des mines de ſouphre, & ce-ſont elles qui fourniſſent aſſeurement la matiere pour allumer ce feu. On dit qu' Alexandre le Grand meſura la mer en cet endroit, & n' y trouua point de fond. Il y a pourtant une petite Iſle appellée Fireſia, á la pointe de laquelle on peut donner fonds, & point en aucun autre endroit.

It has been often obſerv'd, that upon the Falling of Thunder there has been produc'd in the Air, near the Places where it fell, a ſtrong Odour of Burnt Brimſtone. And I remember, that being one Night at a Town built almoſt upon the great Lake of *Geneva*, anciently called *Lacus Lemanus:* The Thunder was ſo violent as much frighted the Inhabitants; though (by reaſon of the Neighbourhood of the high Mountains of *Savoy* and *Switzerland*) Thunders be very frequent there: And the next Day I had a great Complaint made me, of the ſtrong Stink of Sulphur, produc'd by the Thunder that fell hard by, into the Lake, and was ready to overcome by its Smell, even a Souldier that ſtood Centionel near it.

On *July* 24. *An.* 1681. The Ship *Albemarl*, whereof Mr. *Edward Lad* was then Maſter, being an hundred Leagues from *Cape Cod* in Latitude 48. about 3 P. M. met with a Thunder Storm, the Lightning burnt the Main-top-ſail, ſplit the main Cap in pieces, rent the Maſt all along. There was in ſpecial one dreadful Clap of Thunder, in Report bigger than of a great Gun, at which all the Ships Company were amazed: then did there fall ſomething from the Clouds upon the Stern of the Boat, which it broke into many ſmall Parts, ſplit one of the Pumps, the other Pump much hurt: it was a Bituminous Matter, ſmelling much like fired

Gunpowder: it continued burning in the Stern of the Boat. They did with Sticks diſſipate it, and poured much Water on it, and yet they were not able, by all they could do, to extinguiſh it, until ſuch time as all the Matter was conſumed. But the ſtrangeſt thing of all is yet to be mentioned.

When Night came, obſerving the Stars, they perceived that their Compaſſes were changed. As for the Compaſs in the Biddekel the North Point was turned clear South. There were two other Compaſſes unhung in the Locker in the Cabbin, in one of which the North Point ſtood South like that in the Biddekel. As for the other the North Point ſtood Weſt, ſo that they ſailed by Needle, whoſe Polarity was quite changed. The Seamen were at firſt puzled to work their Veſſel right, conſidering that the South Point of their Compaſs was now become North: But after a little Uſe it was eaſy to them; thus did they ſail a thouſand Leagues. As for the Compaſs, wherein the Lightning had made the Needle to point Weſtward; ſince is was brought to *New-England* the Glaſs being broken, it has, by means of the Air coming to it, loſt its Vertue. One of their Compaſſes which had quite changed the Polarity, from North to South, is ſtill extant in that Country, in the Hands of Mr. *Encreaſe Mather*; the North Point of the Needle doth remain fixed to this Day as it did immediately after the Lightning cauſed the Alteration.

An induſtrious Gentleman that was long an eminent Planter of Trees, wherewith he furniſhed many of his Neighbours, preſented me with a Piece of a Branch that ſeemed to have had a Slit, for it reached thorow the Bark almoſt to the very Wood, from one End to the other, but had now the Lips of the Wound overgrown on each ſide with new Bark: Of this kind of Gaſhes, he told me, he found in other Branches of the ſame Tree, which made him think that ſome envious Knave had done this in Spite: but conſidering the Circumſtances more curiouſly, he found that Conjecture much diſcountenanced by ſome of them, and ſuſpected that theſe Wounds muſt have been made by ſome deſignleſs Agent. For by his own Obſervations, and thoſe of his Friends, it appeared, that theſe Fiſſures are to be met with, not only in divers others of his own Trees, of differing kinds, and in differing Plantations, but alſo in the Trees of ſeveral others, which tho growing in the ſame Country, were remote enough from his: ſo that it having been obſerved with ſome Wonder, that in the foregoing Seaſon, Lightnings had been very numerous and frequent, he and his Friends concluded, for Reaſons that need not be here repeated, that the abovementioned Gaſhes were ſome of the odd Effects of thoſe Lightnings, which kept me from wondering at his negative Anſwer, to the Curioſity I had to know, whether all theſe Wounds of the Trees look'd the ſame way, as Eaſt or Weſt, North or South. For I had formerly obſerved, that the ſame Fulmen or Flaſh of Lightning reaching to the Earth in the Form of Fire, appeared by the recent Effects as well of its impetuous Motion as of its violent Heat, to have moved in an irregularly winding-Line: which made me compare its Motion to that of a Squib, and help'd me to ſolve ſome odd Phenomena of Lightning, that this is not the fitteſt Place to diſcourſe of: the foregoing Mention of what happened to the Trees, being deſigned, partly to preſerve the Memory of an unuſual Phenomenon, and partly to ſhow that whatever is wont to happen in Animals, Lightning is not always deſtructive or corruptive of

Vegetables, ſince the Wounds inflicted to Trees were happily cicatrized, and did not kill or poiſon the Plants. And whether this Phenomenon were produced, by ſome mineral Exhalations kindled in the Air, or by the violent and irregular Motion of ſome ſuch Subſtance, or by both together, the Phenomenon will be pertinent to the Subject or Deſign of the preſent Tract.

TITLE XIII.

Of Celeſtial *Influences or Effluviums in the Air.*

To Mr. *HARTLIB.*

Dear Sir,

I Shall not I hope altogether forget the Charge which you have been pleaſed to lay upon me, in reference to the Conſideration of all winy Liquors, their Affections, and the ſeveral Diſtempers incident to them, with my Thoughts about the preſerving of them, ſo as may beſt retard the Quickneſs of their Motion, and hinder their Dyſcraſy and Corruption.

To which End an exact Scrutiny into the Air, its Quality, Temperament and Motion, and an Inquiry of the Efficacy and Force that this hath upon all ſuch Bodies, will be in ſome meaſure neceſſary.

And this puts me in mind to leave one Requeſt with you, *viz.* to beg your Aſſiſtance and Countenance on all Occaſions to Mr. *Streete*, when he ſhall at any time wait on you, who both as to his Undertaking, and to the Modeſty and Simplicity of his Spirit, doth very much emulate our ſo much joint-eſteemed Friend Mr. *Mercator*, who, though he may differ from the former, in reference to his Method, or to ſome of the profounder Parts of Learning: yet I think it very poſſible to reconcile them in the main, and cannot but expect ſomething extraordinary, in the aſſerting and perfecting of the Theory of the Planets, will be brought forth between them, which I ſhould the more gladly ſee, by how much moſt Scholars complain of it, as of a thing hitherto wanting, by how much alſo I gueſs, that having the Examples of ſo many who have already attempted the ſame thing in vain, they will find themſelves the more conſtrained to lay down ſome new choice, ſingular and undeniable Hypotheſis, for the better Invitation of the Admittance of their Opinion among Learned Men, although ſuch a Work be no leſs neceſſary alſo for other Reaſons.

For if we aſſert not the Theory of the Planets rightly, and upon ſuch Ground as are indubitably demonſtrable; we ſhall never be free from Errors and Diſagreements in Opinion about their Motions, and the right Calculation of them.

And if we miſtake in either of theſe, we muſt miſtake of the true Place in the Heavens, in which each Planet is, or conſtantly ought to be: And if we at all err in our Judgment of their due Places, it is impoſſible we ſhould aſſert their ſeveral *Aſpects*, and the mutual Influences and Virtues they have (through this) one upon another: And ſo the Phyſical Uſe of their Motions falls to the Ground wholly, or at leaſt becomes ſubject to very much Uncertainty.

And truly, if there be no ſuch Uſe at all of the Motions of theſe Bodies, as that which I may call Phyſical, *viz* for predicting, and for (in ſome meaſure) determining the Affections, Diſpoſitions and Alterations, that are introduced into ſeveral things here, either immediately, or into the Air immediately, by reaſon of the Courſe of theſe ſuperior Bodies, it would very much leſſen and depretiate with me, that Toil, Coſt, Pains, Watchings, and continual Exerciſes, and Indeavours, that have been uſed for the gaining of exact Obſervations in Aſtronomy. Seeing when we have done all, and obtained all beyond the mere bare Knowledg of them, we can propound no End, Benefit, Uſe or Advantage, that may recompenſe the Trouble and Pains beſtowed upon them, (at leaſt upon ſome of them) nor ſo much as any real or particular Relation, between us and them; and if ſo, we know them only to know them.

But we ſhall at preſent preſume the contrary, and therefore ſhall crave leave to ſay, that although ſeveral Objections are commonly brought againſt any ſuch Uſe or Application of theſe Bodies, or of their Power, Influence or Motions, which are occaſioned partly by the Superſtition and Paganiſm incident to this kind of Doctrine; partly by the Impoſture, Ignorance, and want of Learning, generally obſerved in the Perſons profeſſing this Knowledg; partly by the manifeſt Miſtakes and Uncertainty that there is in the Predictions of this Nature; and partly by the Inexplicableneſs of the Way or Manner how they come to affect one another, which admits not, as many conceive, of an eaſy viſible or familiar Demonſtration. Yet all theſe Objections, if throughly examined, do not, as we humbly conceive, really null or take away the Poſſibility of the thing ſimply, but are raiſed rather againſt the Enormities and Imperfections that are confeſſed to be in it: and it may, notwithſtanding all thoſe Objections, ſtill be certain, that theſe Celeſtial Bodies (according to the Angles they make one upon another, but eſpecially with the Sun or with the Earth in our Meridian, or with ſuch and ſuch other Points in the Heavens) may have a Power to cauſe ſuch and ſuch Motions, Changes and Alterations (ſtronger or weaker, according to the Nature of the Angle) as the Extremities of which ſhall at length be felt in every one of us: And this may be evidenced, 1*ſt.* by undeniable Experiments, not only from things inanimate and vegitate, but from the undoubted Obſervations of Phyſicians, as well in ſeveral Chronical as acute Diſtempers, and more eminently in all Lunatick, Epileptick, Paralitick or Lethargick Perſons. 2*dly.* It may further admit of a Demonſtration: for if the extream Motions of Phyſick be Generation and Corruption, and the mean Motions Rarefaction and Condenſation, allowing then theſe Bodies to have a ſhare in promoting the mean Motions, (*viz.*) of Rarefaction and Condenſation, we ſhall or may ſoon be convinced, that their Effects then upon all other things here, cannot but be exceeding conſiderable.

For the better underſtanding of which, I ſhall offer a little more largely to you my Conceptions, *viz.*

That to ſpeak properly and ſimply, I take Generation and Corruption to be the Extreams of Motion, rather than Motions themſelves; for the Scope, Intentions or Effects of all Phyſical Motions (ſtrictly ſo taken) are only to one of theſe Ends, *viz.* either for Generation or Corruption: and theſe two are they alſo which limit and bound all Motion; for beyond theſe Meets there is no Phyſical Progreſſion, and therefore theſe two muſt be the true *Termini*, as well *à quo*, as *ad quem*, of all ſuch Motion, ſeeing all things are corrupted to be generated, and all things generated are at length corrupted.

But if theſe be rather the *Termini* and Extreams of Motion, then Motion it ſelf. We muſt acknowledg, there are Motions, which Nature uſeth as Means, between theſe two Extreams; which mean Motion muſt be as oppoſite alſo one to another, as the two Extreams. Otherwiſe we ſhould never be at a Certainty, which way Nature intends by her Motion: otherwiſe alſo we muſt ſay one and the ſame Courſe, or one and the ſame thing in Nature, may ſimply and of it ſelf, be the immediate Cauſe of Generation and Corruption, of Life and of Death, of Hardneſs and Softneſs, which is abſurd and impoſſible.

Now as theſe two Motions of Rarefaction and Condenſation, are oppoſite one to the other, as is required, ſo do they ſquare to all other the Inſtruments and Phenomena in Nature, (*viz.*) the one anſwering to Heat, the other to cold; the one to Hardneſs, Compactneſs and Aridity, the other to Gentleneſs, Softneſs, Sweetneſs, Maturity, *&c.*

For which Reaſons therefore, as well as for many other, which might be urged, (if inſiſted on) we do conclude, (ſubmitting it nevertheleſs to be examined) that Generation and Corruption, Rarefaction and Condenſation, is the ſimpleſt, plaineſt and trueſt Analyſis, that can be found in Nature, for all Phyſical Motions, as unto ſome of which all Motion, purely Phyſical, may (as we humbly conceive) without ſtraining, be immediately referred, and as by and through which all may likewiſe, with as little Difficulty, be reſolved.

And having laid this as a ſecond Argument; we ſay *3dly.* That it cannot be denied, but all the Affections and Diſpoſitions of Moiſture, Heat, Cold, Drought, the Courſe of all Winds, Showers, Thundering, or whatſoever elſe is uſed by Nature, to produce theſe two general and univerſal Effects of Rarefaction and Condenſation, do in a great Meaſure, if not wholly, depend upon, and are altogether regulated by the Courſe, Motion, Poſition, Situations or Aſpects of the Superiour and Celeſtial Bodies or Planets. And therefore, *4thly.* We ſay, that every Planet hath its own proper Light: And as the Light of the Sun is one thing, the Light of the Moon another; ſo every Planet hath its diſtinct Light, differing from all the other. Now we muſt either ſay, that this Light is a bare Quality, and that the utmoſt Uſe and End of it is only to illuminate; and there is no Light but is accompanied further with ſome Power, Virtue or Tincture, that is proper to it: which if granted, it will inform us then, that every Light hath its own Property, its own Tincture and Colour, its own ſpecifique Virtue and Power; and that according to the ſeveral Bodies of Light, there are ſeveral Properties, Tinctures and Powers; and that as one Star differs from another in Glory (according to the Apoſtle) ſo one Star and one Planet differs from another in its Virtue, in its Colour, in its Tincture, and in its Property.

And conſequently, that thoſe eminent Stars and Planets that are in the Heavens, are not to be conſidered by us as ſluggiſh inergetical Bodies, or as if they were ſet only to be as bare Candles to us, but as Bodies full of proper Motion, of peculiar Operation, and of Life. The Sun not only ſhining upon the reſt of the Planets; but by his quickning Warmth, awakening, ſtirring and raiſing the Motions, Properties and Powers, that are peculiar to them. According therefore to the Angles, they make with the Sun, and according as they are more or leſs enlightned by him; according alſo as they are at the ſame time more directly or more obliquely, more remotely or more nearly ſcituated and placed, in reſpect to us; ſo muſt the Effects of the Powers, Virtues and Tinctures, that are proper to them, be more or leſs felt by us. *5thly.* For the manner of the Planets, tranſmitting theſe their Properties and Powers, and of their affecting other Bodies at ſo remote Diſtance, there is nothing begged or required in it, that is inſuperable to a Man's Apprehenſion or Belief: (ſeeing,)

1. We affirm not any Property, Operation, Virtue, or Power, to be tranſmitted from any of the ſaid Planets, but what doth deſcend with its Light, and is the real Property of its Light.

2. No Man judgeth, that the Light of any Planet, or of the Sun it ſelf, is refracted, or by any other means weakned, hindred or impaired by the Æther (or that Subſtance which fills up the Space between one Planet and another) through which it paſſeth; but that it doth deſcend whole directly and inrefracted unto, or upon our Atmoſphere.

3. But whatſoever is received by the Atmoſphere, is alſo received by the thin and ſubtile Air, that is contiguous to the Atmoſphere: And this Air therefore cannot but be capable of being moved, ſtirred, altered, and impreſſed by theſe Properties, Virtues and Lights, as penetrating each Part of it.

4. Not only the Air, by reaſon of its Thinneſs and Subtilty, is capable of being thus penetrated, moved and altered, by theſe Planetary Virtues and Lights: But foraſmuch alſo as our Spirits, and the Spirits likewiſe of all mix'd Bodies, are really of an Aerious, Ethereal, Luminous Production and Compoſition; theſe Spirits therefore of ours, and the Spirits of all other Bodies, muſt neceſſarily no leſs ſuffer an Impreſſion from the ſame Lights, and cannot be leſs ſubject to an Alteration, Motion, Agitation and Infection, through them and by them, than the other (*viz.*) the Air: But rather as our Spirits are more near and more Analogous to the Nature of Light than the Air, ſo they

muſt be more prone and eaſy to be impreſſed than it. And if our Spirits, and the Spirits of all mix'd Bodies may be altered, changed, moved and impreſſed by theſe ſuperiour Bodies, and their Properties; then theſe Spirits being the only Principles of Energy, Power, Force and Life, in all Bodies wherein they are; and the immediate Cauſes, through which all Alteration comes to the Bodies themſelves. It is impoſſible therefore Spirits ſhould be altered and changed, and yet no Alteration made in the Bodies themſelves: and therefore a leſs Limit or Extream cannot be ſet to the Power or Operation, or Force of the ſuperiour Bodies upon the Inferiour, than what muſt terminate at length into the very Bodies themſelves.

5. As a further Confirmation or Proof of this, in reference at leaſt to our ſelves, I ſhall offer to your Conſideration the Accidents that often happen to Men, by the mere Air, as Convulſions, Cramps, Blaſtings, Lameneſs, Colds, many of which indure a Man's Life-time; and which (with many bitter Infirmities that ſometimes ſeize upon a Man, while ſtanding, walking, or lying in the Air) are rarely or never felt or diſcerned at the Inſtant of their Approach or Inſults upon a Man, nor yet accompanied with the Senſe of any Exceſs in the Air for Heat or Cold at that time, and therefore not well referrable to any Cauſe in the Air, if not to the Power of thoſe Properties and Operations of the Celeſtial Bodies that we ſpeak of: And this I ſubmit to the Judgment of common Experience.

6. Laſtly; As the Sun-ſhining on the reſt of the Planets doth not, as we ſaid, only barely illuminate their Bodies; but beſides this, through the Power, Virtue and Activity it hath, doth alſo raiſe, excite, awaken and ſtir up the ſeveral Properties and Diſpoſitions that

are in thoſe ſeveral and reſpective Bodies, whereby they are more lively and effectually brought forth upon us; ſo we are to ſuppoſe it is in reference to this our Planet, which is the Earth, which is not only enlightned, warmed, cheriſhed and fructified by the Power, Virtue and Influence of the Sun; but hath its proper Magnetical, Planetary Virtue, alſo fermented, ſtirred, agitated and awakened in it, which it remits back with the reflected Light of the Sun: and together with this Magnetick Planetary Property of the Earth, which is ſtirred and raiſed by the Sun, are awakened alſo the ſeminal Diſpoſitions, Odors and Ferments that are lodged in, and proper unto particular Regions or Places, which do likewiſe emit and diffuſe through the Air, as their ſeveral and reſpective benign, grateful, ſo their ſeveral malignant, congelative and fracedonous Natures and Qualities.

And hence therefore, though the Air, its Temperament, Diſpoſition and Quality in general, is to be look'd at, according to the Motions, Influences and Aſpects of the ſeveral ſuperiour Bodies; yet the particular Healthfulneſs and Unhealthfulneſs of Places, the evil Diſpoſition of the Air, Evenings, Nights, and early in the Mornings, in ſome Parts more than in others; the ſuper-abundant Moiſture, exceſſive Winds, Droughts or other Seaſons, proper to one Country, and not to be obſerved in another neighbouring to it; all theſe are rather to be allowed and referred to thoſe Odors, Vapors and Exhalations, that are through the Power of the Sun, or other Planets, drawn forth from their particular Seats into the Air, from the Planets themſelves.

And thus I have hinted, as well as I may, at the Solutions of all the Phenomena pertaining to this matter, that I can think of.

And if this be ſo, then wholly to neglect this Phyſical Uſe (and Conſideration) of the Motion of theſe Bodies, and either to reject it, becauſe of the Superſtition that hath been mix'd with it, or to exclude it from all manner of Care, and from all other further Scrutiny, as a thing not worth our Inquiry or Search at all after, is as great an Extream on the other hand, and a Miſtake, that muſt not paſs untaxed among Learned Men.

You did not expect, I am ſure, I ſhould have adventured into ſo particular an Apology for Aſtrology; nor did I intend it, when I begun my Letter; nor do I now aim to juſtify any thing further, than what may properly, if not neceſſarily, fall into the Conſideration of Natural Philoſophy, being indeed much induced to think, that were the Theory of the Planets ſo exactly ſtated, ſo perfectly, or ſo undeniably demonſtrated, that we might be ſure we rightly underſtood the Place, Courſe and Poſition of each of their Bodies in the Heavens; this other Doctrine of their Phyſical Uſe, with the Weight, Dignity, Extent, Conſiderableneſs or Inconſiderableneſs of it, would ſoon confirm and demonſtrate it ſelf by the Evidence and Proof of it ſelf, eſpecially if any will pleaſe to take the Pains to calculate theſe Motions for his own private Uſe, and according to the Meridian he is in, and ſo compare them with his own Obſervations, of the Change and Alteration of the Air from Day to Day. Which doubtleſs, as it was the way at firſt taken by the Ancients, to find out their Efficacy, (I mean the making ſuch a conſtant Obſervation, and keeping ſuch a Diary) ſo the doing of that again, and giving us firſt an Hiſtory or Diary of the Obſervations of the Weather, and its Changes in all Reſpects, and then an Account of the ſeveral Places, Motions, or

Aſpects, each Day, of the ſeveral Bodies of the Heavens, with the Agreements, Doubts, or Diſagreements, that theſe bear one to another, and that muſt neceſſarily riſe thereupon, would be that, that could not but prove both ſatisfactory and delightſom to us, in this great Point, about their Phyſical Power and Uſe.

And the Commodity of this in our Oeconomical or Civil Concerns in Husbandry, in Gardening, in Phyſick, and to the producing many other very ſtupendous Effects, cannot poſſibly be ſo well credited or diſcerned as it would, if ſome ſuch plain Foundation and Demonſtration of the Power of theſe Bodies, in general, were laid. Which methinks we ſhould be much the more incouraged to undertake, having an Advantage given us in this Age, beyond what moſt Ages ever had, by the Uſe of thoſe rare Inſtruments, that they call the Thermometers, or Weather-Glaſſes.

And truly when I conſider, that things of the greateſt Conſequence do oft-times depend upon the moſt common Obſervations; and that Matters of the higheſt Improvement do receive their Beginning from mean, ſmall, ordinary Experiments: I would have no Man, who hath Leiſure, Opportunity and Time, to think it a ſlight thing to buſy himſelf in collecting Obſervations of this Nature. It being much more commendable for a Man to preſerve the Hiſtory of his own Time, though but in the Obſervation of the Motions of this kind, than to ſay, upon every Occaſion that offers it ſelf, this is the hotteſt, or this is the coldeſt; or this is the rainieſt, or this is the moſt ſeaſonable or unſeaſonable Weather that ever he felt; whereas it may perhaps be nothing ſo.

And if there were no other Uſe, yet Obſervations of this Nature would much conduce to compleat the natural Hiſtory of any Place, as we may obſerve by that Learned Author who writ *Hiſtoriam Naturalem Braſiliæ*; and who, to prove not only the Habitableneſs, but Healthfulneſs of that Climate and Country, exhibites the Account of every Day's Weather, obſerved by him for many Years together, and ſo the Agreement of it to that Temper, which we account healthful.

But the inſtituting and perfecting of accurate Obſervations of this Nature, by the help of ſeveral large and exact Thermometers, placed in ſeveral Rooms, or expoſed after ſome convenient Manner to the Air it ſelf, would be a more noble and uſeful Undertaking, than ordinary. I ſay, the doing this accurately, by large and exact Glaſſes, by placing ſeveral of them, either together, or at ſome fit Diſtance one from another. It being much to be lamented, and that which I cannot but complain to my ſelf of, that no Improvement conſiderable hath, as I can learn, been made by any Man, of theſe Glaſſes, either in our own Country, or any where elſe, ſince their firſt Invention, (but only to hang them in a Room for Ornament ſake) there being many things yet wanting, that were much to be deſired for the perfecting of them. For;

1. None hath hitherto given us the beſt Proportions between the Diameter of the Head, and the Diameter of the Bodies or Cylinder, although this be indeed the very firſt Conſideration, and that which is moſt neceſſary in the Uſe of theſe Inſtruments; for as by how much the bigger the Cylinder is, and by how much the leſſer the Head, by ſo much the more ſlow and imperceptible the Air's Alteration and Motion will be; ſo by how much the bigger the Head, and ſmaller the Cylinder is, by ſo much the more quick, ſubtile and diſcernable will every ſmall Difference of the Air appear, which therefore

fore being on both ſides capable of an Extream, ought to be regulated neceſſarily, according to ſome mean.

2. Admitting a mean or convenient Proportion between theſe two Diameters, to be as one to 16, or one to 24. We in the next Place do no leſs want the fitteſt Proportion for the Length of the Cylinder, which muſt doubtleſs alſo be varied anſwerably, as we vary the Proportion of its Diameter, the ſmaller Cylinder in Proportion to its Head, requiring the greater Length, the bigger Cylinder on the contrary the ſhorter Length.

3. I have not hitherto ſeen any Cylinder that hath been well graduated, 12 or 16 Degrees being the moſt that are ſet upon the common Weather-Glaſs: whereas to the making of accurate Obſervations, it would require a Cylinder to be divided into at leaſt 360 Parts; though I think it neither unreaſonable nor unpracticable, to have one divided into 1000 Parts, allowing but 10 Degrees to each Inch, which is no unuſual Diviſion, ſeeing ſuch an one will much better diſcover, not only the ſmall, but the more ſuddain and remarkable Changes of the Weather, (which are of chiefeſt Uſe) than any others that are common and ordinary.

4. Although no Liquor ought to be uſed in theſe Glaſſes, that is ſubject to Froſt; yet we have little or no Account what thoſe Liquors are, that might be beſt or fitteſt for the accurate making of thoſe Experiments; whether thoſe whoſe Property it is, ſomewhat to attract the Air, and ſo to preſerve themſelves in at leaſt their firſt Quantity, as *Oleum Sulphuris per Campanam*, *Ol. Vitrioli*, *Liquor Salis Tartari*, *&c.* Or, 2*dly*. Whether thoſe whoſe Parts are fineſt, ſubtileſt, and neareſt of kin to the Air, ſuch as is Spirit of Wine, Spirit of *Terebinth*, well rectified, and according as there is occaſion ſtill freſh ſupplied. Or, 3*dly*. Whether thoſe that are

of a middle Nature, as ſtrong Spirit of Vinegar. Or, 4*thly*. Whether inſtead of theſe, and beyond theſe, it may not be beſt to uſe only well-refined Quickſilver.

All which ſeveral Particulars, as they are neceſſary, and ought to be firſt aſcertained, yet they are but preliminary to the Experiments themſelves.

In the making of the Experiments themſelves, therefore it would be convenient; 1*ſt*. That ſeveral Thermometers of one Proportion, Length and Graduation in their Cylinders in all Reſpects, as near as may be, were ſet in one Frame together, either with one and the ſame, or with Variety of Liquors. 2*dly*. That ſeveral of theſe Frames were ſet in ſeveral Rooms, and that ſome were expoſed immediately to the Air it ſelf; yet ſo as it may be conveniently ſheltred from the actual Rays of the Sun, and from the Injury of Storms, Rain and Winds.

In the Hiſtory it ſelf, there cannot be too much Care and Exactneſs provided; the Air of the Chimny, Cranny of a Wall or Door, Breath of People, or other ſuch Accidents, do not interpoſe to deceive a Man's Obſervation, which muſt be circumſpectly foreſeen and conſidered.

The Proportion between the Warmth of the Day and Night, in conſtant Weather; the Agreement or Diſagreement of the Motion of the Air; with the Motions of the ſuperiour Bodies, in all uncertain, changeable and inconſtant Weather; the Efficacy or Inefficacy through theſe, in foretelling of Winds and Rain; the Air its particular Diſpoſition, under Thunder, under times of Mildews or Blaſtings, eminent Eclipſes, Conjunctions; with many other the like Particulars, which will of themſelves be incident to an ingenious, diligent, apprehenſive Perſon, may be the Subject of this Hiſtory.

I ſhall not digreſs ſo far, as to tell you, what other things may be done by the Help of this excellent Inſtrument, this being not pertinent to our preſent Purpoſe.

Yet it is certain, that *Drebble*, that great, ſingular, learned Mechanick, did by the Help of this Inſtrument, make a Dial continually to move of it ſelf; regularly ſhewing both the times of the Day, and other Motions of the Heavens; did alſo make an Automatous Inſtrument of Muſick; and found out a Furnace which he could govern to any Degree of Heat: but whether theſe have died with him, or how far the Meditations of others have wrought upon them, I ſhall humbly refer to a more leaſurable Inquiry. And if you can inform me among any of your Acquaintance or Correſpondents, I ſhould be glad to hear and to learn any thing of this Nature, or relating to the further Uſe, Experiment or Improvement of this rare little Inſtrument, or to the further clearing, ventilating or diſcuſſing the Theory or Doctrine of the Planets, or the Phyſical Uſe and Power of theſe Bodies that we have thus briefly made an Eſſay of. Thus far that Letter.

They have a received Tradition in *Java*, and probably in divers other Iſlands of the South Sea, that the Beams of the Moon are wont to cauſe Contractures in the Body of thoſe Men that ſtay too long expoſed to them: The Truth of which Tradition was lately confirmed to me by an ingenious Doctor, that with Applauſe practiſed Phyſick in thoſe Parts; who aſſured me, that he had obſerved, that upon the Account before mentioned ſome were made lame, or elſe had ſome of their Limbs contracted for divers Weeks, and ſome for many Months, or even a longer time. And when I asked him, whether he had at any time been ſubject to that Miſchief himſelf? He anſwered, that whilſt he was a Novice in thoſe Parts, after a very hot Day, he laid himſelf down very ſlenderly covered, to ſleep (according to the Cuſtom of the Place) near the Door of the Houſe he lodg’d in; but being unacquainted with the Tradition, he unskilfully choſe a Place upon which the Moon could fully beat for a good part of the Night, which being paſt before he wak’d, when he went to riſe, he found his Neck ſo ſtiff, that he was ſcarce able at all to ſtir it; and his Mouth was ſo drawn awry, that ’twas hideous to behold, and continued ſo unſightly, that Shame forced him to keep within for ſome Days; during which he made Uſe of brisk Aromatick Medicines, by whoſe Help he got off a Contracture that uſed to ſtay very much longer with others. And when I asked him, if theſe Diſtempers were not occaſioned rather by the Coldneſs of the Night and Subtilty of the Air, than the Operation of the Moon’s Beams? He anſwered me, that ’twas generally obſerv’d, that the other Cauſes, without the direct Beams of the Moon, were not wont to produce ſuch bad Effects; and that his Landlord, when he ſaw his Mouth awry, told him, that if he had made him acquainted with his Deſign to paſs the Night in the open Air, he would have prevented this Miſchief, by lodging him in a Place unexpoſed to the Moon’s Light.

TITLE XIV.

Of the Height *of the Atmoſphere.*

TITLE XV.

Of the Motion *of the Air, and of* Winds.

Extract of a Letter from Fort St. George, *dated* January *the* 23*d*, 1668.

ALthough the Bar of *Porta Nova* proved more ſhallow and dangerous than we were informed; yet ſhe (our Ship) got ſafe in thither: and it was well ſhe did ſo. Had we kept her here, there had been no Poſſibility of her Eſcape from periſhing in a dreadful Storm, or rather Hurricane, which happened here the 22*d* of *November*: The like hath not been known here in any Man's Memory. The Tempeſt of Wind and Rain was ſo exceeding violent, that nothing could ſtand before it; Men and Beaſts carried into the Sea by the Violence of the Winds and Floods: the Generality of the Houſes in this and the Neighbour Towns were ruined: ſcarce any Trees left ſtanding in Gardens or elſewhere: the Wall of this Town laid flat in ſeveral Places; your *Godownes* and other Houſes in and about the Fort, uncovered and exceedingly ſhattered: no Place in the Fort where we could keep our Perſons, Books or Papers free from the Wind or Rain: nor ſcarcely any Doors could ſtand againſt the Violence of it: and we hourly ſeared the falling of the Fort down upon us, it was ſo exceedingly rock'd: and yet abroad we could have no Shelter, nor were able to ſtand againſt it. The repairing of the Damage will neceſſarily require a great Charge, which at firſt we thought would have amounted to 3000 Pagothes: but hope it will come ſhort thereof.

Captain *Brookehaven* told me, that about the Iſland *Mauricius*, Hurricanes were the moſt frequent of any Place he knows; and that near that Iſland he met with one which laſted four Days in all: in one of which Days the Storm had ſeven Paroxyſms or Exacerbations, which the Seamen call Frights of Weather, each of which he obſerved to differ two Points of the Compaſs from the preceding; by which Means the Surface of the Sea, by the Colliſion of the Waves, became to be all white, as if the Ship had been among Rocks. He added, that the Storm made the Day exceeding dark: And that the Noiſe was rather like that of Thunder, than of Wind, inſomuch that thoſe on the Shrouds could not hear thoſe on the Deck.

A Learned Phyſician that travelled into *America*, affirmed to me, that thoſe Countries only have conſtant Winds from the Land in the Night, which are furniſhed with Hills; and therefore the *Barbadoes* wants ſuch Winds, becauſe it has no Hills.

One of the *Eaſt-Indian* Committee (who had lived Years in the Iſland of *Teneriff*) anſwered me, that he uſually obſerved there the Briezes to come in from the Sea about nine of the Clock in the Morning, and that about two Hours after Sun ſet, there blew a ſharp Land Wind, every way from the Iſland to the Sea-ward, which continued all Night till the next Morning.

A Learned Traveller anſwered me, that though the Air were generally calm and clear at the Top of the Mountains, yet ſometimes he had met there with Winds conſiderably ſtrong.

In Lettere di Venetia.

MArtedi ſui li 29. Agoſto 1679. alle hore 19. incirca ſi leuolevò nelle Paludi della Villa di Fauis del Dominio Ceſareo tre miglia lontana da Palma Noua Dominio Veneto un ucnto chiamato Biſſa boua, che allargandoſi per circa cinquanta paſſi ſcorſe con tanto empito, e furore, che portò per aria diuerſi huomini, che tagliauano il fieno in quei Prati, e anco alcuni Carri carichi di fieno con i Buoui precipitandoli aſſai lontano con la rouina delli animali, de Carri, e degli huomini, e paſſando per i Campi sbarbicando ogni ſorte di Piante le portò per aria gettandole molti paſſi lontano, rendendo la terra per oue ſcorſe coſi arſa, che pare non ui ſii mai ſtata piantata coſa alcuna. Arriuò nella villa decta Bagnaria del Dominio Veneto doue gettò a terra molte Caſe ſino a fondamenti, et altre diſcoperſe, e rouinò portando per aria tauole, traui, et ogni altra coſa che era dentro eſſe Caſe reſtando mal trattate molte Perſone ſenza però la morte di alcuno. Fuori di dettata Villa ui e una Chieſa chiamata S. Tomaſo la quale reſto ſcoperta, e rouinata una parte del muro portando uia il Campanile, e Campane che nel giorno ſeguente non ſi erano per anco trouate ;——Di lá ſi portò uerſo Seuigliano Dominio Veneto e rouinò tutta la Campagna ſenza danno però della Villa, mentre li paſsò poco lontano, e girando poco lungi dalla Villa ſteſſa ſpiantò da fondamenti un Palazzo del D.Co.Horatio Straſoldo,nel quale gli amazzò ogni ſorte di animali che ui erano, portando per aria li mobili e ſino le botti, eſterminando parre della poſſeſſione. Non reſtorono però offeſe Perſone, perche erano alla Campagna a lauorare, e nel camino getto pure a terra due altre Caſe che ſono nel Taglio per andare a

Straſoldo ſpiantandole affacto con la morte di una Donna, d' un Fanciullo, e diuerſi Animali.

Di là uoltò uerſo Palma, et arriuando ſino alle mura della Fortezza girò uerſo la Villa di Priuano mezo miglio diſtante quale rouinò la meta, ſpiantando da fondamenti beliſſimi Palazzi, portando per aeria travi, tavole, et ogni altra coſa con la morte di molti, quantità di feriti, e diuerſi ſtrapazzati con far alla Campagna di molto male. Di poi ſcorſe nella Villa di Viſco Dominio Imperiale, e tra li altri danni fatti roninò tutto il Palazzo novo del D. Marco Foſcolini Gentilhuomo di Cinidal nel quale eſſendoni una gran rimeſſa da Carozze,la di cui Porta hauena tre Cadenazzi, & entrando il Turbine per li balconi gettò la Carozza con tanto empito nella Porta ſteſſa che la ruppe, e portò fuori la Caroza tutta fracaſſata gettandola ſopra un muro della Corte aſſa alto,portando il Cielo della ſteſſa mezzo miglio lontano, e vertò nel medemo Palazzo ferito, e mal trattato un ſeruitore di eſſo Foſcolini, di cui ronino pure una Braida, & un Brolo eſſendo in detta Villa reſtati due morti, e diverſi feriti; —S' inoltrò poi nella Villa di S. Vido di Crauglio ſtato Imperiale, la quale rouino tutta affatto ſenza reſtarui nemeno una Caſa, portando per Aria coppi, travi, legne, ſaſſi, e mobili con la morte di moltiſſime Perſone, e moltiſſimi feriti e rouinati, et in detta Villa non ſi può anddare, ne con Carri, ne con Caualli per la grande moltitudine di rouinazzo, arbori et altro che hanno attrauer-ſato le ſtrade, eſſendo rimaſſi morti gran numero di animali—.

Da queſto luoco ſi portò uerſo Villes Villa Imperiale buona parte della quale gettò a terra per andar al Territorio di Monfalcone con la morte di molte perſone, et quantità di animali con laſciar le Campagne per dove è paſſata ſenza piante, e come ſtrada battuta———.

Hà danneggiato anco altre Ville ma leggiermenre,

ne per anco ſi sà quello hauerà fatto piu avanti nel detto Territorio.

Queſto ſucceſſo hà laſciato un ſpauento grande in queſte Parti, eſſendoſi uedute coſe incredibili mentre pioveuano ſaſſi, tauole, arbori, traui, coppi, huomini, donne, fanciulli, botti, ſorghi, uva, galline, animali, et in concluſione ciò che incontraua portaua per aria con un rumore, e fracaſſo così gradne, che faceua terrore eſſendo per dette Ville un concorſo grande di Popolo uicino per uedere coſe che ſi rendono incredibili.

Doctor *B.* anſwered me, that though the Eaſtern Winds blow near ¾ of a Year at *Tangier*, yet they ſeem not to reach far into the Inland Country, where he obſerved them to be very unfrequent.

An ingenious Gentleman who is Owner of a Mine or two near the Sea, being asked by me, whether he could, by any peculiar Change appearing in the deeper Parts of the Mines, foretel any Alterations of Weather? He anſwered me, that the only Preſage he had conſtantly obſerved, was of the Change of the Wind. For many Hours before the Wind was to ſhift from ſome other Corner, and get into the South, the Water at the bottom of the Mine would appear manifeſtly more troubled, or leſs limped than before; and when the Wind was to blow from the Eaſt, he was uſually forewarned of it by an unuſual Degree of Clearneſs in the Waters, which would appear more diaphanous than ordinary, though the South-Wind had not immediately before operated on the Waters. The Depth of the Mine was between fifteen and twenty Fathom.

He told me, that the Hurricans about *Goa*, are obſerved to come uſually but at two Seaſons, about the Beginning of *March*, and the 4*th* of *October*.

TITLE XVI.

Of the Air as the Medium of Sounds, *and of Sounds and Noiſes in the Air, and particularly Thunder; and of the Air's Operation on the Sounds of Bodies.*

THIS Variety of the Air is the Cauſe of moſt dreadful Thunders, which, when *Gregory* deſcribed, he aſtoniſhed his Hearers. For upon the riſing of ſeveral Tempeſts altogether, the Sky is of a ſudden covered over with black and thick, as it were Globes of ſmokey Clouds: By and by the Thunder breaks forth on every Side, ratling continually with Lightning, as inceſſantly flaſhing, enough to amaze the moſt reſolute and moſt accuſtomed to the Noiſe. Ludolph's *Hiſt. of Ethiop. l.* 1. *c.* 5.

The String of a Viol has been by Mr. *F.* obſerved to give a ſharper Sound againſt or in rainy Weather, by almoſt half a Note.

Mr. *F.* alſo aſſures me, that more than once or twice it has happened to him, that having put up falſe Strings in his Pocket, to make Frets of, as judging them uſeleſs for any other Purpoſe, the want of Strings having driven him to make Uſe of thoſe, he has found them not falſe any more, but good Strings. And alſo that he obſerves ſome Strings apter to receive a Tenſion from the moiſt Air, than others are.

TITLE XVII.

Of the Weight of the Air.

A ſhort Account of the Statical Baroſcope, imparted by Mr. Boyl, *March* 24. 1665. *In a Letter to Mr.* H. Oldenburgh.

AS for the new kind of Baroſcopes, which I lately intimated to you, that my Haſte would not permit me to give you an Account of, though the Neceſſity of preparing for an approaching Journey, gives me the ſame Excuſe, I then had; yet ſince your Letters acquaint me, that you ſtill deſign a communicating to the Curious, as much Information as may be, in reference to Baroſcopes, I ſhall venture to ſend you ſome (though but an imperfect) Account of what I did but name in my former Letter to you.

Though by a Paſſage you may meet with in the Page of my *Thermometrical Experiments*; and though you may find, that I did ſome Years ago think upon this new kind of Baroſcope; yet the Changes of the Atmoſphere's Weight not happening then to be ſuch as I wiſhed, and being unwilling to deprive my ſelf of all other Uſe of the exacteſt Ballance that I (or perhaps any Man) ever had; I confeſs to you, that ſucceſſive Avocations put this Attempt for two or three Years out of my Thoughts, till afterwards returning to a Place, where I chanc'd to find two or three Pairs of Scales, I had left there, the Sight of them brought it again into my Mind; and though I were then unable to procure exacter, yet my Deſire to make the Experiment ſome Amends for ſo long a Neglect, put me upon conſidering, that if I provided a Glaſs Bubble more than ordinarily large and light, even ſuch Ballances as thoſe might, in ſome meaſure, perform, that which I had tried with the ſtrangely nice ones above-mentioned.

I cauſed then to be blown at the Flame of a Lamp ſome Glaſs Bubbles as large, thin, and light, as I could then procure: and chuſing among them one, that ſeem'd the leaſt unfit for my turn, I counterpoized it in a pair of Scales, that would loſe their *Equilibrium* with about the 30*th* part of a Grain, and were ſuſpended at a Frame. I placed both the Ballance and the Frame by a good Baroſcope, from whence I might learn the preſent Weight of the Atmoſphere: then leaving theſe Inſtruments together, though the Scales being no nicer, than I have expreſſed, were not able to ſhew me all the Variations of the Air's Weight, that appear in the Mercurial Baroſcope; yet they did what I expected, by ſhewing me Variations no greater than alter'd the Height of the Mercury half a quarter of an Inch, and perhaps much ſmaller than thoſe: nor did I doubt, that if I had had either tender Scales, or the means of ſupplying the Experiment with convenient Accommodations, I ſhould have diſcerned far ſmaller Alterations of the Weight of the Air, ſince I had the Pleaſure to ſee the Bubble ſometimes in an *Equilibrium*, with the Counterpoize, ſometimes when the Atmoſphere was lighter, preponderate ſo manifeſtly, that the Scales being gently ſtirred, the Tongue would play altogether on that ſide, at which the Bubble was hung: and at other times, when the Air was heavy (that which was at the firſt but the Counterpoiſe)

terpoiſe) would preponderate, and upon the Motion of the Ballance, make the Tongue vibrate altogether on its ſide: and this would continue ſometimes many Days together, if the *Air* ſo long retained the ſame meaſure of Gravity; and then again the Bubble would regain an *Equilibrium*, or a Preponderance. So that I had oftentimes the Satisfaction by looking firſt upon the Statical Baroſcope (as for Diſtinction ſake it may be called) to foretel, whether in the Mercurial Baroſcope the Liquor were high or low. Which Obſervations, though they hold as well in Winter as the Spring, yet the Frequency of their Viciſſitudes (which perhaps was but accidental) made them more pleaſant in the latter of theſe Seaſons.

So that the Matter of Fact having been made out by Variety of repeated Obſervations, and by ſometimes comparing ſeveral of thoſe new Baroſcopes together, I ſhall add ſome of thoſe Notes, about this Inſtrument, which readily occur to my Memory, reſerving the reſt till another Opportunity.

And, 1. If the Ground on which I went in framing this Baroſcope, be demanded, the Anſwer in ſhort may be; 1*ſt*. That though the glaſs Bubble, and its Counterpoiſe, at the time of their firſt being weighed, be in the *Air*, wherein they both are weighed, exactly of the ſame Weight; yet they are nothing near of the ſame Bulk, the Bubble by reaſon of its capacious Cavity (which contains nothing but *Air*, or ſomething that weighs leſs than *Air*) being perhaps a hundred, or two hundred times bigger, than the Metalline Counterpoiſe. 2*dly*. That according to an Hydroſtatical Law, (which you know I have lately had occaſion to make out) if two Bodies of equal Gravity, but unequal Bulk, were to be weighed in another Medium, they will be no longer equiponderant: but if the new Medium be heavier, the greater Body, as being lighter *in ſpecie*, will loſe more of its Weight than the leſſer and more compact: but if the new Medium be lighter than the firſt, then the bigger Body will outweigh the leſſer. And this Diſparity ariſing from the Change of Mediums, will be ſo much the greater, by how much the greater Inequality of Bulk there is between the Bodies formerly equiponderant. *3dly.* That laying theſe two together, I conſider'd, that 'twould be all one, as to the Effect to be produced, wherein the Bodies were weighed in Mediums of differing Gravity, or in the ſame Medium, in caſe its (ſpecifick) Gravity were conſiderably altered; And conſequently, that ſince it appeared by the Baroſcope, that the Weight of the Air was ſometimes heavier, and ſometimes lighter, the Alteration of it in Point of Gravity, from the Weight it was of, at firſt counterpoiſing of the Bubble in it, would unequally affect ſo large and hollow a Body as the Bubble, and ſo ſmall and denſe an one, as a Metalline Weight; and when the Air, by an Encreaſe of Gravity, ſhould become a heavier Medium than before, it would buoy up the Glaſs more than the Counterpoize, and if it grew lighter than it was at firſt, would ſuffer the former to proponderate. (The Illuſtration and Proof can ſcarce be added in few Words, but if it be deſired, I may, God permitting, ſend you them at my next leiſure.) And though our Engliſh Air, being about a thouſand times lighter than Water, the Difference in Weight of ſo little Air, as is but equal in Bulk to a Bubble, ſeem'd to give ſmall Hopes, that it would be ſenſible upon a Ballance; yet by making the Bubble very large and light, I ſuppoſed, and found the Event, I have already related.

2. The hermetically ſeal'd glaſs Bubble, I imployed, was of the Bigneſs of a ſomewhat large Orange, and weighed about one Drachm and ten Grains. I thought it very poſſible, if I had been better furniſhed with Conveniences (wherein I afterwards found, I was not miſtaken) to make (among many that might be expected to miſcarry) ſome, that might be preferrable to this, either for Capacity or Lightneſs, or both, eſpecially if Care be taken, that they be not ſeal'd up whilſt they are too hot. For though one would think, that it were advantageous to ratify and drive out the Air, as much as is poſſible, becauſe in ſuch ſeal'd Bubbles the Air it ſelf (as I have elſewhere ſhewn) has a Weight, yet the Advantage countervails not the Inconvenience of being obliged to increaſe the Weight of the Glaſs, which when it includes highly ratified Air, if it be not ſomewhat ſtrong, will be broken by the Preſſure of the external Air, as I have ſufficiently tried.

3. By reaſon of the Difficulties, and Caſualties, that may happen, about the procuring and preparing ſuch large and light Bubbles, as I have been lately mentioning, it may in ſome Caſes prove a Convenience to be informed, that I have ſometimes, inſtead of one ſufficiently large Bubble, made Uſe of two that were ſmaller; And though a ſingle Bubble of competent Bigneſs be much preferrable, by reaſon, that a far leſs Quantity and Weight of Glaſs is requiſite to comprize an equal Capacity, when the Glaſs is blown into a ſingle Bubble, than when it is divided into two; yet I found, that the employing of two inſtead of one, did not ſo ill anſwer my Expectation, but that they may for a need ſerve the turn, inſtead of the other, than which they are much eaſier to be procured.

This Inſtrument may be much improved by divers Accommodations. As, 1*ſt.* there may be fitted to the *Anſa* (or Checks of the Ballance) an Arch of a Circle, divided into 15 or 20 Degrees, (more or leſs according to the Goodneſs of the Ballance) that the Tongue reſting over againſt any of theſe Diviſions, may readily, and without Calculation, ſhew the Quantity of the Angle, by which when the Scales propend either way, the Tongue declines from the Perpendicular, and the Beam from its Horizontal Paralleliſm. 2*dly.* Thoſe that will be ſo curious, may inſtead of the ordinary Counterpoiſe (of Braſs) imploy one of Gold, or at leaſt of Lead, whereof the latter being of equal Weight with Braſs, is much leſs in Bulk, and the former amounts not to half its Bigneſs. 3*dly.* Theſe Parts of the Ballance that may be made of Copper or Braſs, without any Prejudice to the Exactneſs, will by being made of one of thoſe Metals, be leſs ſubject than Steel to ruſt with long ſtanding. 4*thly.* Inſtead of the Scales, the Bubble may be hung at one End of the Beam, and only a Counterpoiſe to it at the other, that the Beam may not be burden'd with unneceſſary Weight. 5*thly.* The whole Inſtrument, if placed in a ſmall Frame, like a ſquare Lanthorn with Glaſs Windows, and a Hole at the top for the Commerce of the internal and external Air, will be more free from Duſt and irregular Agitations, to the latter of which it will otherwiſe be ſometimes liable. 6*thly.* This Inſtrument being accommodated with a light Wheel, and an Index, may be made to ſhow much more minute Variations than otherwiſe. 7*thly.* The Length of the Beam, and Exquiſitneſs of the Ballance, may eaſily, without any of the foregoing Helps (and much more with them) make the Inſtrument far exacter than thoſe, I was reduced to imploy. And to theſe Accommodations, divers other may be ſuggeſted by a further Conſideration of the Nature of the thing.

Though in ſome Reſpects the Statical Baroſcope be inferiour to the Mercurial, yet in others it has its own Advantages and Conveniency about it.

At *firſt* it confirms *ad oculum*, our former Doctrine, that the falling and riſing of the Mercury depended upon the varying Weight of the Atmoſphere, ſince in this Baroſcope it cannot be pretended that a *fuga vacui*, or a *Funiculus*, is the Cauſe of the Changes we obſerve. 2*dly*. It ſhows, that not only the Air has Weight, but a more conſiderable one than ſome learned Men, who will allow me to have proved, that it has ſome Weight, will admit. 3*dly*. This Statical Baroſcope will oftentimes be more parable than the other, for many will find it more eaſy to procure a good pair of Gold Scales, and a Bubble or two, than a long Cane ſeal'd, a Quantity of Mercury, and all the other Requiſites of the Mercurial Baroſcope, eſpecially if we comprize the Trouble and Skill that is requiſite to free the deſerted part of the Tube from Air. 4*thly*. And whereas the Difficulty of removing the Mercurial Inſtrument has kept Men from ſo much as attempting to do it even to Neighbouring Places, the eſſential Parts of the Scale Baroſcope (for the Frame is none of them) may very eaſily in a little room be carried whereſoever one will, without the Hazard of being ſpoil'd, or injur'd. 5*thly*. There is not in Statical Baroſcopes, as in the other, a Danger of Uncertainty, as to the Goodneſs of the Inſtrument, by reaſon, that in the Mercurial the Air is in ſome more, and in ſome leſs, perfectly excluded; whereas in *theſe* that Conſideration has no Place. 6*thly*. It being, as I formerly intimated, very poſſible to diſcover Hydroſtatically, both the Bigneſs of the Bubble, and the Contents of the Cavity, and the Weight aud Dimenſions of the glaſſy Subſtance (which together with the included Air make up the Bubble) much may be diſcovered by this Inſtrument, as to the Weight of the Air, abſolute or reſpective. For when the Mercury in the Mercurial Baroſcope is either very high, or very low, or at a middle Station between its greateſt and leaſt Height, bringing the Scale-Baroſcope to an exact *Equilibrium* (with very minute Diviſions of a Grain) you may by watchfully obſerving, when the Mercury is riſen or fallen juſt an Inch, or a 4*th*, or ½ of an Inch, *&c.* and putting in the like minute Diviſions of a Grain to the lighter Scale, till you have again brought the Ballance to an *Equilibrium*, you may, I ſay, determine what known Weight in the Statical Baroſcope, anſwers ſuch determinate Altitudes of the aſcending and deſcending Mercury in the Mercurial: And if your Ballance be accommodated with a divided Arch, or a Whele and Index, theſe Obſervations will aſſiſt you for the future, to determine, by ſeeing the Inclination of the Tongue, or the Degree mark'd by the Index, to conclude readily, what Potency the Bubble has, by the Change of the Atmoſphere's Weight, acquired or loſt.

Some Obſervations of this Nature I watchfully made, ſometimes putting in a 64*th*, ſometimes a 32*d*, ſometimes a 16*th*, and ſometimes heavier parts of a Grain to the lighter Scale: But one that knew not for what Uſes theſe little Papers were, coming to a Window where my Baroſcope ſtood, ſo unluckily ſhook them out of the Scales, and confounded them, that he robb'd me of the Opportunity of making the nice Obſervations I intended, though I had the Satisfaction of ſeeing, that they were to be made. *7thly.* By this Statical Inſtrument we may be aſſiſted to compare the Mercurial Baroſcopes of ſeveral Places (though never ſo diſtant) and to make ſome Eſtimates of the Gravities of the Air therein. As if, for inſtance, I have found by Obſervation, that the Bubble I imploy (and one may have made divers Bubbles of ſeveral Sizes, that the one may repair any Miſchance that may happen to another) weighed juſt a Drachm, when the Mercurial Cylinder was at the Height of $29\frac{1}{2}$ Inches (which in ſome Places I have found a moderate Altitude) and that the Addition of the *16th* part of a Grain is requiſite to keep the Bubble in an *Equilibrium*, when the Mercury is riſen an *8th*, or any determinate part of an Inch, above the former Station: When I come to another Place, where there is a Mercurial Barometer, as well freed from Air as mine (for that muſt be ſuppoſed) if taking out my Scale-Inſtrument, it appears to weigh preciſely a Drachm; and the Mercury, in the Baroſcope there, ſtand at $29\frac{1}{2}$ Inches, we may conclude, the Gravity of the Atmoſphere not to be ſenſibly unequal in both thoſe two Places, though very diſtant. And though there be no Baroſcope there, yet if there be an additional Weight, as for inſtance, the *16th* part of a Grain, requiſite to be added to the Bubble, to bring the Scales to an *Equilibrium*, it will appear, that the Air, at this ſecond Place, is at that time ſo much heavier than the Air of the former Place was, when the Mercury ſtood at $29\frac{1}{2}$ Inches. But in making ſuch Compariſons, we muſt not forget to conſider the Situation of the ſeveral Places, if we mean to make Eſtimates not only of the Weight of the Atmoſphere, but of the Weight and Denſity of the Air. For though the Scales will ſhow, as hath been ſaid, whether there be a Difference of

Weight in the Atmoſphere at the two Places; yet if one of them be in a Vale or Bottom, and the other on the Top, or ſome elevated part of a Hill, it is not to be expected, that the Atmoſphere in this latter Place, ſhould gravitate as much as the Atmoſphere in the former, on which a longer Pillar of Air does lean or weigh; ſo that the Bubble in both theſe Places ſhould be preciſely of the ſame Weight.

And the mention I have made of the differing Situation of Places, puts me in mind of ſomething, that may prove another Uſe of our Statical Baroſcope, and which I had Thoughts of making Trial of, but was accidentally hindered from the Opportunity of doing it; namely, that by exactly poizing the Bubble, at the Foot of a high Steeple or Hill, and carrying it in its cloſe Frame to the top, one may, by the Weight requiſite to be added to the Counterpoize, there to bring the Beam to its horizontal Poſition, obſerve the Difference of the Weight of the Air at the bottom and at the top; and in caſe the Hill be high enough, at ſome intermediate Stations. But how this may aſſiſt Men to eſtimate the abſolute or comparative Height of Mountains, and other elevated Places, and what other Uſes the Inſtrument may be put to, when it is duly improved, and the Cautions, that may be requiſite in the ſeveral Caſes, which ſhall be propoſed, I muſt leave to more leiſure, and further Conſideration.

Weight of a Cubick Inch of Water.

I cauſed to be made with great Care, by a skilful Mathematical-Inſtrument-maker, a hollow Cube of Braſs, whoſe every Side was as exactly as could be procured, an Engliſh Inch. This we carefully counterpoiſed in a very good pair of Scales, and found it to weigh 11 Drachms, 1 Grain and $\frac{1}{2}$, (Troy-Weight) Then placing it in one of the Scales as horizontally as we were able, we warily fill'd it with clear common Water, (of the beſt ſort of that called Pump-water) till the Surface of the Water ſeem'd to lie as level, as we could make it, to the Brims of the Veſſel: then weighing it carefully, we found the Water alone (for the Cube had been counterpoized before) to weigh 254$\frac{7}{16}$ Grains: So that in regard 'tis ſcarce poſſible to know, that ſuch a Veſſel is ſo filled, as to come nearer Exactneſs, than within a Drop or two: I preſume we may, without any ſenſible Error, ſuppoſe an Inch of Water to weigh 256 Grains, which latter Number I rather chuſe, becauſe its *aliquot* Parts make it more convenient, and it agrees well enough with ſome Trials, that I made with ſolid Cubes, to meaſure the true Weight of a Cubick Inch of Water.

This done, the Veſſel was well dried within, and the ſame Scales being well counterpoized, the Inſtrument was ſo too, and being placed on one of the Scales as Horizontically as we could, Mercury (diſtilled to have it more pure) was warily put into it, till by Degrees it had filled the Veſſel as to Sight; but we neither expected, nor found, that it would be brought to an exact Level, and exquiſitly fill all the Corners of the Veſſel. But when it ſeem'd to be ſo well filled, that even a critical Eye could not readily find fault with it, though the Mercury appeared capable of ſome Acceſſion without overflowing, we weighed the Quickſilver it ſelf (for the Veſſel had been counterpoized before) and found it to weigh 7 Ounces, 2 Drachms, (Troy) which falling ſomewhat ſhort (though not very much) of what the above-mention'd Weight of the Water required, we tried to add a little more Quickſilver, without making it run over, and found the Increaſe of 82 Grains; ſo that now the Quickſilver weighed 7 Ounces, 3 Drachms, 22 Grains; but it ſeem'd when the Eye was placed in a

The Weight of a Cubick Inch of Quick-ſilver.

Level with the Brims of the Veſſel, that it was rather a little of the higheſt, than any way depreſſed, and yet was not ſo full, but that we could add 112 Grains to the former Weight, without making it run over; and perhaps we might have added yet more, but I decline doing it, becauſe the laſt mentioned Acceſſion ſeem'd manifeſtly to make it ſo much ſwell above the Brims of the Veſſel. By all which 'tis evident that 'tis ſcarce poſſible to determine preciſely by ſuch hollow Inſtruments, the true Weight of a Cubick Inch of Quickſilver. And therefore, ſince by other ways of Trial, I have found the Proportion of the Weight of Mercury to Water of the ſame Bulk, to be ſomewhat leſs than that of 14 to 1, I think we may, without any conſiderable Inconvenience, ſuppoſe the Weight of a Cubick Inch of Quick-ſilver to be 3580 Grains, which is near 14 times the above-mentioned Weight of a Cubick Inch of Water, and comes near enough to the ſecond or middlemoſt of the three Eſtimates lately ſet down; and by the leaſt Eſtimate of all it appears that a Cubick Inch of Quickſilver weighs $7\frac{1}{4}$ Ounces Troy Weight, that is 8 Ounces Averdupois Weight: And conſequently when the Quickſilver of the Baroſcopé, kept up by the Counterpoize of the Air 30 Inches, (as I have obſerved it ſeveral times to be within a Month laſt paſt) the Weight of the Air that is incumbent on an Inch Square here below, amounts to 18 *l.* $\frac{1}{8}$ Troy Weight; that is in Averdupois Weight 15 *l.* $\frac{1}{17}$.

The Weight of a Pillar of the Atmoſphere.

As 11 to 14, or rather as 355 to 452, ſo is the Area of a Square inſcribed in a Circle to the Area of the circumſcribed Circle.

Hence 355 : 452 :: 1 : 1, 2732394.

Hence if the ſide of an inſcribed Square be an Inch, that multiplied by an Inch, renders a Cubick Inch for the ſolid Content.

In like manner if the Height of a Cylinder erected on the circumſcribing Circle, be an Inch, the ſolid Content of that Cylinder is 1,2732394.

Wherefore 1, and 1,2732394 multiplied, by the Weight of the Cubick Inch of any kind of Metal, give the Weight of a Cubick Inch, and of a Cylindrick Inch that circumſcribes the ſame, whence an Inch Table for both is eaſily made, by continual Addition, or for any Height propounded, multiplying both by the ſame.

Nov:	23	2		28. 98
	24	8		29. 54
		9 p		28. 90
	25	3¼		80
	27	9 p		99
	29	9		28. 97
		9 p		29. 09
Dec.	6	9 p		28. 97
	7	9		60
	8	9		29. 05
	11	9		28. 93
		3 p		29. 01
	13	8½		28. 90
		9 p		95
	25	9 p		29. 04
	26	9 p		28. 32
	28	10 p		29. 13
Jan.	1	9 p		28. 99
	2	9		82
	3	9		29. 08
		9 p		06
	5	10		28. 70
	6	10		29. 09
		9½ p		28. 62
	7	8		28. 99
	12	10		28. 88
		4 p		98
	16	1		29. 13
		9 p		28. 65
	17	10		14
	21	9½		29. 05
	22	4		28. 99
		9 p		94
	23	9		99
	24	11 p		29. 06
	25	9		28. 50
		9 p		29. 10
	29	9		28. 90
		9 p		71
	30	8		80
	31	9 p	30. 12	
Febr.	1	12	22	
	2	8½	29. 97	
	15	9 p		28. 99
	16	9 p		95
	17	8		29. 10
Mar.	2	9 p		28. 98
	4	8½		78
		9		86
	12	9		28. 80
		9 p		66
	13	8½		29. 03
1671 *Apr.*	1	6 p		28. 99
	2	9 p		78
	3	8½		29. 03
June	8	1		29. 18
		8 p		28. 86
	9	7		99
Aug.	12	6		28. 90
Sept.	6	8½		29. 15
	7	10½		28. 65
	8	7½		29. 05
	12	9½		28. 98
	29	8		28. 96
		3 p		29. 08
	30	9 p		29. 19
Octo.	1	10		28. 63
	3	8		29. 10

In all thoſe Papers the Mercury was ſtill about 12 *of one Inch higher than is ſet down, for the Numbers ſignify only bottom of the Cap.*

d	h	Th.	Bar.	Wind.	Weather at *Oxford*.
1666					
June 24	9	70	29.	N E 2	Fair.
	22	76	29. 1		Fair.
25	4	73	29. 1	N E 1	Fair.
	10	74	29. 1	E 1	Fair.
	15	77	29. 1	S E 2	Fair.
26	9	73	28. 8	N 1	Fair.
	12	75	28. 7	N E 1	Thunder.
	13	75	28. 7	S W 4	Thunder, Rain, Hail.
	14	74	28. 8	N 0	Thunder, Rain.
	18	73	28. 8	N 1	Clouds, dry.
	22	72	28. 8		Fair.
27	7	70	28. 8	N W 1	Rain.
	9	70	28. 8	N W 1	Rain.
	16	68	28. 8	W 1	Fair.
28	9	63	29. 1	W 0	Clouds.
	17	67	29. 1	N 1	Clouds.
29	9	63	29. 2	N 1	Clouds.
	19	69	29. 1	N 1	Clouds.
30	9	64	29. 2	N 0	Clouds.
	20	64	29. 2	N 1	Fair.
July					
1	9	57	29. 4	W 2	Fair.
2	11	63	29. 3	W 1	Clouds.

1666	*July*					
d	h	Th.	Bar.	Hy.	Wind	Weather.
	21	67˙	29 2.			Rain.
3	9	66.	29 1˙		W 1	Clouds.
	22	66.	29 1.			Clouds.
4	11	64˙	28 8˙		W 0	Clouds.
	17	68˙	28 7.		S E 2	Clouds.
5	9	65·	28 7.		S W 2	Clouds.
	23	65˙	28 7.		S W 2	Rain.
6	9	63	29 1˙		W 1	Fair.
	16	67.	29 1˙		S W 1	Clouds.
7	9	67	29 1˙		S 2	Fair.
	23	72	28 7˙			Lightning.
8	9	70.	28 8˙		S W 2	Clouds.
9	9	66·	29 2·		S W 2	Fair.
10	9	66˙	29 1˙		S 2	Clouds.
11	10	67.	29 1·		S 2	Clouds.
12	10	66.	29 2·		S 2	Fair.
13	10	66.	29 3˙		W 1	Fair.
14	3	75.	28 8·		S W 2	Clouds.
15	9	67.	29 1˙		S W 1	Fair.
16	11	70˙	29·1˙		S W 2	Fair.
17	5	71.	28 8·		E 0	Clouds after Rain.
	19	71.	28 8·		W 1	Rain.
18	7	62.	29 2˙		S W 2	Fair.
	9	64.	29 2˙		S W 2	Fair.
19	9	65.	29 3.		S W 2	Cloudy.
20	12	67.	29 4.		W 1	Fair.
21	8	64˙	29 4·		W 1	Fair.
22	9	67.	29 3·		S W 1	Fair.
23	9	67.	29 2.		E 1	Thunder, Rain.

1666	*July*					
d	h	Th.	Bar.	Hy.	Wind	Weather.
	15	71.	29 1˙		NE 1	Fair.
	17	71.	29 1˙		E 1	Rain.
	21	69˙	29 2.		1	Clouds, Lightning.
24	9	67˙	29 2˙		N 1	Clouds.
25	9	67˙	29 2·		N 1	Clouds.
26	6	64˙	29 3˙		N 1	Cloſe.
30	23	69˙	29 3˙	15		Fair.
31	7	67˙	29 3˙	15	NW 0	Fair.
Auguſt						
15	10	60	29 2˙	20		Clouds.
16	9	59˙	29 2˙	19	N 1	Fair.
29	21	64	29 2˙	19		
30	9	59	29 3·	19	N 0	Fair.
31	7	61.	29 3·	20	NE 0	Fair.
	9	61	29 3.	20	NE 1	Fair.
September						
1	6	55	29 3˙	17	NE 1	Fair.
	9	55·	29 3˙	17	E 2	Clouds.
2	9	52˙	29 3.	16	E 3	Clouds.
3	9	49˙	29 4.	16	E 2	Fair.
4	9	47˙	29 3˙	15	E 1	Fair.
	13	50˙	29 3.	15	E 2	Dim reddiſhSun-ſhine
	20	51.	29 2˙	14		This unuſual Colour of the Air, which without a Cloud appearing, made the Sun-beams of a ſtrange red dim Light, was very remarkable. We had then heard nothing of the Fire of *London:* But it appeared afterwards to be the Smoak of *London* then burning, which driven this way by an Eaſterly-Wind, cauſed this odd Phenomenon.
5	22	49.	29 1˙			
6	9	44·	29 2.	15	NE 1	Fair.

1666	*Septemb.*					
d	h	Th.	Bar.	Hy.	Wind	Weather.
8	9	44.	29 4˙	15	NE 1	Fair.
9	9	46:	29 4.		SW 1	Thick, Sun.
	17	52.	29 2:	18	S 2	Rain.
	22	53.	29 --.	20	2	Rain.
10	9	52˙	28 8·	20	SW 3	Fair.
	16	56˙	28 8:	20	W 2	Rain.
11	11	53	28 8:	22	SW 2	Cloudy.
12	9	52	29 --	23	S 3	Cloſe.
13	9	50·	29 2·	23	W 2	Fair.
14	9	53˙	29 1.	23	SE 2	Fair.
15	10	57.	29 1.	27	NE 1	Cloſe.
	11	57˙	29 1.	28	NE 1	Rain.
	23	61.	29 1.	35		Fair.
16	9	59	28 8˙	34	E --	Miſt.
	21	61˙	28 7˙	37		Rain.
17	9	54˙	28 8.	35	NW 1	Cloſe.
	22	49·	28 1·	30		Rain.
18	9	42.	28 8.	37	NE 4	Cloſe after Rain.
	11	43.	29 1.	36	EN 3	Cloſe.
	13	44.	29 2.	35	EN 3	Cloſe.
	17	45·	29 3.	35	E 2	Fair.
	23	45	29 4.	35	0	Fair.
19	9	41˙	29 5.	35	N 1	Fair.
20	9	46.	29 4.	37	N 1	Cloſe.
21	8	47˙	29 3˙	36	0	Thick Miſt.
	22	52.	29 4.	38	0	Fog.
22	10	48.	29 4.	37	SW 1	Cloſe.
23	9	46.	29 5˙	37	W 0	Clouds.
24	8	49˙	29 4˙	38	SW 1	Fair.

1666	*Septemb.*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
	21	55.	29 2	39	2	Fair,h 19 few drops
25	6	53.	29 1.	38	S 1	Clouds.
	10	54	28 8.	39	S 3	Rain.
	21	50.	29 1·	38	0	Fair.
26	8	49˙	28 7˙	39	W 3	Cloſe.
27	9	48˙	29 2.	37	W 3	Fair.
	23	48˙	29 4.	36	2	Fair.
28	7	45.	29 5.	36	W 2	Fair.
	19	47˙	29 4˙	37	2	Rain.
29	7	51	29 4.	40	W N 1	Rain.
	12	53	29 5.	38	W N 2	Fair.
	18	53.	29 5˙	35	N W 0	Fair.
30	9	48	29 6˙	37	W S 0	Clouds.
	21	57˙	29 5˙	46	2	Fair.
October						
1	8	54˙	29 5˙	45	S 1	Clouds.
	19	61.	29 5·	43	0	Fair.
2	9	56˙	29 5˙	44	S W 2	Cloſe.
3	7	54.	29 5.		S W 0	Cloſe.
November.						
25	10.	32˙	29 1·			
26	9˙	31.	29 2.		0	Thick Fog.
	18	31.	29 1·		0	Fog.
27	11	33.	29 1·		W 0	Fair.
	18	34˙	29 2·		0	Clouds.
	22	34.	29 2.		2	Clouds.
28	10	39·	28 7˙	63	S W 2	Rain.
	21	36˙	28 7˙	62	2	Fair.
30	9	31	28 7.	60	W S 2	Fair.

1666	*Novemb.*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
	22	31.	29 1·	61		Fair.
December						
1	9	29·	29 3˙	61	W 0	Fair.
	22	29.	29 4.	61	0	Fair.
2	9	27.	29 2.	60	SE 2	Clouds, Thaw.
3	9	27˙	28 7˙	60	E 1	Clouds.
	17	27˙	29 7˙	61	0	Rain.
4	9	26˙	28 8˙	60	SE 0	Thick Fog.
	12	26˙	28 8·	61	S 1	Snow.
5	9	30.	28 6˙	63	S 1	Hard Rain.
	21	34.	28 6˙	63	2	Fair.
6	9	34·	29 1.	64	WS 1	Fair.
	18	36˙	29 1˙	64	0	Small Rain.
7	9	32˙	29 3.	63	W 0	Fair.
8	9˙	32	29 3˙	65	WS 3	Small Rain.
	23	35.	29 3.	64	0	Rain hard.
9	9	31	29 1.	63	N 2	Hard Snow.
	17	29˙	29 1˙	63	0	Fair.
10	21	26.	29 5.	63		Fair.
11	9	24˙	29 5·	63	WN 1	Hard Froſt, fair.
	21	21˙	29 5˙	60	2	Fair.
12	9	20.	29 6.	59	N 1	Fair, hard Froſt.
13	10	21˙	29 6˙	61	N 1	Fair, hard Froſt.
14	9	22˙	29 6.	63	NW 1	Little Miſt, and ſlow Thaw.
	11	24.	29 5˙	63	NW 2	Clouds, Thaw.
15	9	25˙	29 6.	64	N 1	Fair, little Thaw.
16	9	24·	29 6˙	63	NE 0	Fog, hoar Froſt.

1666	*Decemb.*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
	17	24·	29 6.	63	NE 0	Thaw, Clouds.
17	9	22·	29 6·	63	N 0	Clouds, hard Froſt.
	22	23.	29 5·	64		Thaw, Clouds.
18	10	24.	29 5.	65	N 2	Small miſty Rain.
	21	24·	29 5·	64		Small Rain.
19	9	23.	29 5.	64	NW	Small Snow, Thaw.
20	9	23.	29 5.	64	N 2	Miſt, Thaw.
	22	22·	29 5·	64	0	Fair, freeze.
21	10	20·	29 3·	63	SW 2	Hard Froſt, Clouds.
	21	22.	29 2·	63	1	Snow.
22	9	22.	29 2·	63	NW	Clouds, no Thaw.
	22	21·	29 2.	63		Froſt, fair.
23	8	21.	29 1·	64	N 0	Little Snow laſt Night, Froſt, cloſe.
	21	20.	29 3·	63	0	Fair, hard Froſt.
24	10	17·	29 4·	62	NW 2	Fair, hard Froſt.
	17	18:	29 3·	63	W 1	Snow.
25	9	18·	29 4	62	NW 1	Hard Froſt, fair.
	22	19.	29 4·	61		Fair, hard Froſt.
26	9	18·	29 3·	62	W 1	Fair, hard Froſt.
	19	22.	29 2·	63	0	Clouds, Thaw.
27	8	22·	29 2·	64	NW 1	Fog.
	16	22·	29 2·	63	NW 1	Cloſe, Thaw.
	21	22.	29 2·	63	NW 0	Cloſe, Freeze.
28	9	20·	29 3.	63	NW 0	Cloſe, Froſt.
	22	18.	29 3·	63	NW 0	Cloſe, Froſt.
29	10	16	29 4·	63	NW 0	Fog, hard Froſt.
	22	15·	29 5.	62	0	Thick Fog, hard Froſt.

1666	*Decemb.*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
30	9	15.	29 4·	62	N W 0	Very thick Fog, and hard Froſt.
	22	15.	29 4.	62	N W 0	Clear, hard Froſt.
31	8	14.	29 4·	62	N W 0	Fair, hard Froſt.
	15	15.	29 5.	63	N W 0	Fair, hard Froſt.
January 1667						
1	8	12.	29 4·	62	N W 0	Fog, hard Froſt.
2	10	13·	29 6·	63	S E 0	Fair, hard Froſt.
3	9	10·	29 5·	63	S E 0	Fair, hard Froſt.
	22	11·	29 3·	63	0	Cloſe, hard Froſt.
4	10	13	29 3.	63	E S 1	Cloſe, hard Froſt.
5	11	12.	29 2·	62	E 0	Snow, Froſt.
6	9	13.	28 8·	63	E S 0	Snow, Froſt.
	15	14·	28 7·	63	E 0	Cloſe, Froſt.
7	9	16·	28 6·	64	E 0	Cloſe, hard Froſt.
	17	18·	28 6.	64	E. 0	Little dewy Rain, and Tendency to a Thaw.
8	8	20·	28 6·	65	E N 0	Cloſe, Thaw, little Rain.
	21	21·	28 8.	64	0	Cloſe, Thaw.
9	8	21·	29 2.	65	E N 0	Little Snow, and little Thaw.
	21	22.	29 3·	65	0	Cloſe.
10	9	21.	29 3·	65	N E 0	Cloſe, Froſt.
	22	21·	29 2.	65	2	Cloſe.
11	8	20·	29 2·	65	N E 1	Cloſe, Froſt.
	12	21.	29 2.	65	N E 0	Cloſe, gentle Thaw.

1667	*January*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
12	9	21˙	29 2.	64	NE 0	Cloſe, Froſt.
13	11	22.	28 7˙	65	NE 0	Thick Fog, Thaw.
	22	23.	28 8.	65	0	Cloſe, great Thaw.
14	8	24˙	28 7·	65	E 1	Fog, perfect Thaw.
	21	24˙	28 6˙	65	2	Cloſe.
15	10	22˙	28 6˙	64	EN 2	Cloſe, Froſt.
	22	23.	28 6˙	65	0	Small Rain.
16	8	23˙	28 7.	65	ES 1	Cloſe.
17	8	25.	28 7˙	65	EN 0	Fog.
18	7	25.	28 6.	65	NE 2	Snow, Thaw.
	21	23	28 8˙	64	2	Little Snow.
19	8	21.	29 2˙	64	NE 0	Froſt, little Snow.
	22	20.	29 4.	64		Hard Froſt.
20	9	18.	29 5.	63	N 0	Fair, hard Froſt.
	22	20.	29 6.	63	0	Fair, Froſt.
21	8	18.	29 6˙	63	NW 0	Fair, hard Froſt.
	17	21.	29 6˙	63	W 1	Fair, Froſt.
22	9	25.	29 5.	66	SW 2	Rain.
	23	28˙	29 3˙	66	3	Rain.
23	9	29	29 3˙	67	WS 1	Clouds.
	17	32˙	29 4.	67	W 1	Fair.
24	9	29	29 5˙	66	WS 1	Fair.
	21	32·	29 3˙	66	4	Cloſe.
	23	33˙	29 2˙	66	4	Cloſe.
25	8	36.	28 8.	67	SW 3	Little miſty Rain.
	19	42˙	28 6.	73	3	Little miſty Rain.
26	8	38.	28 8˙	72	WS 2	Cloſe.
	12	37˙	28 8˙	73	WS 1	Rain.

1667	*January*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
27	10	33	29 2	70	W S 2	Fair.
28	22	30˙	29 2˙	69	1	Rain.
29	6	30˙	29 2˙	70	1	Miſt.
	16	31.	29 3·	70	N W 0	Clouds.
31	13	26˙	29 4·	69	E 2	Cloſe.
February						
1	9	26˙	29 5·	69	E 2	Cloſe.
2	9	28.	29 5.	70	E 1	Cloſe.
3	9	31.	29 4˙	72	S E 0	Thick Fog.
4	9	33˙	29 5·	72	E 0	Fog.
	22	34.	29 6·	73	0	Cloſe.
5	8	32˙	29 7.	72	E 1	Cloſe.
	22	31.	29 7˙	71	2	Cloſe.
6	18	26.	29 7.	68	N E 1	Clouds.
7	9	24:	29 5˙	69	N E 1	Clouds, Snow in the Night.
	23	23.	29 5·	67	1	Cloſe.
8	10	22˙	29 5·	67	E N 2	Froſt, cloſe.
9	8	21˙	29 4˙	67	E S 1	Cloſe, Froſt.
	22	22.	29 4.	68		Snow.
10	9	23:	29 3˙	69	S E 1	Rain.
	16	28·	29 3.	71	S W 2	Miſty.
	23	32.	29 2˙	73	2	Cloſe.
11	9	34˙	29 2˙	73	S W 2	Miſty.
	22	36˙	29 1˙	74		Cloſe.
12	8	35.	28 7.	74	S E 2	Cloſe.
	22	37.	28 4·	73	2	Fair.
13	8	34˙	28 4.	72	S W 3	Fair.
	22	36.	28 2˙	70	2	Cloſe.

1667	*February*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
14	8	34.	28 4˙	69	W S 3	Fair.
	22	33.	28 6.	68		Fair.
15	8	32.	28 5˙	69	S 2	Rain.
	23	32˙	28 5˙	69	S 2	Fair.
16	23	31˙	28 7.	69	N 1	Cloſe.
17	9	30˙	28 8˙	69	W 1	Fog.
18	11	32˙	29 4.	66	N W 2	Fair.
19	9	28.	29 7.	64	N W	Hoar Froſt, fair.
	15	33·	29 6.	56	S 2	Fair.
20	9	28˙	29 6·	63		Fair.
21	9	28˙	29 5˙	63	E S 1	Fair.
22	8	29.	29 5˙	62	N E 1	Cloſe.
	15	29.	29 5.	60	N E 1	Rain.
23	8	27˙	29 5·	63	N E 2	Cloſe.
24	9	26.	29 6.	62	N E 2	Cloſe.
25	10	25.	29 5.	62	N E 1	Snow.
26	7	23˙	29 4	61	N E 1	Froſt, little Snow.
27	8	23.	29 2·	61	N E 1	Cloſe, Froſt.
28	9	21˙	29 1.	60	N E 1	Fair, Froſt.
March						
1	11	22˙	29 2.	59	E 1	Fair, hard Froſt.
2	10˙	23˙	29 3.	60	N E 1	Clouds, Froſt.
	17	26˙	29 3.	59	N E 1	Hail.
3	9	24˙	29 4.	60	N E 2	Cloſe.
	21	25˙	29 4˙	62	2	Miſty, Rain.
4	9	25.	29 4˙	60	N E 2	Cloſe.
5	9	24˙	29 2.	60	N W 2	Cloſe, about 6 ſmall Snow.
6	23	17˙	29 4.	56	2	Fair, hard Froſt.

1667	*March*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
7	9	15.	29 4.	55	NE 2	Fair, very hard Froſt.
	13	16.	29 4˙	54	NE 2	Snow.
8	8	14˙	29 2˙	54	NE 2	Very hard Froſt, *Thames* frozen, Carts went over.
9	8	18.	28 8·	58	NE 2	Snow hard, already deep, hard Froſt.
10	9	18˙	29 2.	58	NE 2	Cloſe, hard Froſt.
11	8	19	29 3˙	57	NE 1	Hard Froſt, little Snow.
12	8	21.	29 5.	57	EN 1	Froſt.
13	9	21.	29 5˙	56	NE 1	Cloſe, Froſt.
14	8	21˙	29 4˙	56	SE 2	Cloſe, Froſt.
	16	23˙	29 3.	55	SE	Cloſe, Thaw.
15	8	23˙	29 2˙	57	E 1	Miſt, Thaw.
16	8	27.	29 1·	59	SE 2	Rain.
	21	30˙	29 0	60	0	Fair.
17	11	31.	29 2˙	60	NE 1	Cloſe.
18	8	28˙	29 6.	61	NE 1	Fair.
	18	35·	29 6.	62	S 1	Fair.
19	8	33·	29 6·	61	SW 1	Cloſe.
20	6	37.	29 6.	61	W 1	Fair.
21	10	35˙	29 4.	55	SW 2	Small Rain.
	12	36·	29 4.	56	SW 2	Small Rain.
	23	38.	29 1˙	59	3	Cloſe.
22	9	37˙	29 1·	58	W 2	Fair.
23	9	35˙	29 1.	58	SE 1	Clouds.
	11	36˙	29 1.	58	SE 1	Rain.

A Regiſter kept by Mr. Locke, *in* Oxford.

1667	*March*					
d	h	Th.	Bar.	Hy.	Wind.	Weather.
24	9	35˙	29 2.	58	N W 1	Clouds.
26	7.	30	29 5.	50	N W 1	Fair.
27	7	29˙	29 6.	49	N E 1	Fair.
28	9	28˙	29 5.	48	N E 2	Fair.

1669 December. *I began to keep a Regiſter of Heat and Cold at* London, *by a Thermometer of the Royal Society's Standard: This Thermometer I marked* 2

d	h	T.2				
26	9	$\overset{\circ}{3}$				Extream hard Froſt
1670						
January						
13	10	$\overset{\cdot\cdot}{4}$				
	23	$\overset{\cdot\cdot}{4}$				Cloſe.
14	10	4				Cloſe.
	22	$\overset{\cdot}{4}$				Mix'd, *i. e.* Part Clouds, Part clear.
15	23	$\overset{\cdot\cdot\cdot}{3}$				
16	10	$\overset{\cdot\cdot\cdot}{2}$				Fair.
17	10	$\overset{\cdot}{2}$				Fair.
18	9	$\overset{\cdot\cdot\cdot}{2}$				Miſt.
19	10	$\overset{\cdot\cdot\cdot}{1}$				Miſt.
20	1	$\overset{\cdot\cdot}{0}$				Clouds.
	9	0				Cloſe, Froſt.
21	9	1				Cloſe.
22	23	$\overset{\cdot\cdot\cdot}{1}$				Fair.
23	9	$\overset{\cdot\cdot}{1}$				Fair.

1670 d	*January* h	T.2	Bar.	Hy.	Wind.	Weather.
24	9	1̇	—	—	—	Fair.
25	9	1	—	—	—	Cloſe.
26	8	0̇	—	—	—	Snow.
27	10	0̣	—	—	—	Snow.
28	10	ọ̈	—	—	—	Snow.
29	23	0	—	—	—	Hard Froſt.
30	11	0̣	—	—	—	Hard Froſt.
31	11	0⃛	—	—	—	Thaw.
February			—	—	—	
2	11	0	—	—	—	Froſt.
3	10	0⃨	—	—	—	Froſt.
6	23	0	—	—	—	
7	9	0̣	—	—	—	Snow.
8	9	0̤	—	—	—	Fair.
9	10	0̣	—	—	—	Fair.
10	9	1	—	—	—	Cloſe.
11	10	0̤	—	—	—	Fair.
12	10	1̇	—	—	—	Thaw.
13	9	1⃛	—	—	—	Rain.
14	9	0⃛	—	—	—	Fair, Froſt.
17	23	8	—	—	—	Miſt.
20	11	2⃛	—	—	—	Fair.
April			—	—	—	
1	10	1⃛				Cloſe.

1670 *May*	*I here divided the Degres of the* Greſham-Colledg-*Thermometer, each into* 4, *ſo that* 24 *is now the ſame that* 6 *was before.*

d	h	T.2	Bar.	Hy.	Wind.	Weather.
27	9	24				Fair.
29	11	31				Fair.
	23	24				Fair.
30	7	22				Fair.
	23	29				Fair.
June						
1	9	28				Cloudy.
1671						
May						
29	8	20				Rain.
June						
5	8	31				Cloudy.
1672						
January						
31	9	4			NE	Fair.
February						
1	8	5				Fair.
June						
15	16	36..				Cloudy.
16	9	33.				Cloudy.
	17	37.			SW 2	Fair.
20	9	29				Cloudy.
Auguſt						
15	6	24				
17	8	22				Cloſe.

1672						
October						
d	h	T.2	Bar.	Hy.	Wind.	Weather.
13	9	20.				
December						
23	22	20·				
27	17	18·				
1673						
January						
1	22	18·				
4	18	14.				
April						
3	17	5·				Snow.
May						
10	21	16.			E	
June						
9	22	22.			E	Rain.
10	9	21.				Cloudy.
12	9	23.				Fair.
13	22	22·				Rain.
14	9	24·				Cloſe.
17	9	26·				
18	9	26·				Cloſe.
20	9	22·				Fair.
21	9	24.				Fair.
2	6	23·				Fair.
27	10	26·				
28	9	25·				Rain.

1673
July

Memorand. *That from the Beginning of* May, *till the middle of* July, *there was ſcarce one dry Day, but ſo great Rains, that produced greater Flouds than were known in the Memory of Man.*

d	h	T.2	Bar.	Hy.	Wind.	Weather.
2	9	25˙				
8	10	26.				
10	8	25.				Fair.
14	17	31˙				Fair.
25	22	35˙				
28	12	33˙				Cloſe.
30	9	24˙				Fair.
1674						
March						
9	8	1			NE	Froſt and Snow.
19	6	5˙				Snow.
20	10	5:			NE	Snow all Day.
December						
25	15	11.				Fair.
27	16	11.			W	Fair.
28	15	14˙			W	Cloſe.
1675						
January						
3	16	14.			W	Fair.
April						
25	9	12.			NE	Fair.
26	10	12.			N	Fair.
27	12	12˙			E	Fair.
28	9	12.			E	Cloſe.

1675	*May*					
d	h	T.2	Bar.	Hy.	Wind.	Weather.
2	9	16.				Cloſe.
23	15	27.				Cloudy.
June						
8	22	21.				Cloudy.
9	13	21·				Cloſe.
10	14	22.				Cloſe.
13	10	22·			E	Cloſe.
14	9	17·				Fair.

1681 *March* | *The Thermometer marked 3 is one, which I began now to uſe at my Return to* Oxford.

d	h	T.3	Bar.	Hy.	Wind.	Weather.
14	14	46	29 4.		W	A little Miſt.
15	8	36	29 6		N W	Fair.
16	12	45	29 5·		N W 2	Little Rain.
17	7	37	29 7·		E	Fog.
18	8	33	29 7·		E	Fair.
23	11	34	28 8·		N W	Cloſe.
24	12	32	29 2·		N	Cloudy.
25	18	33	28 7·		N W	Cloudy.
26	15	32	8.		N	Cloudy.
27	13	28	29 2·		N	Fair, Snow this Morning.
	14		29 2·		N	Snow hard.
28	11	29	5.		N	Cloudy.
30	7	34	5·		W	Cloſe: All the foregoing Week it rained in Showers every Day.
April						
6	18	49	4·		S	Very fair.
7	9	45	5·		S	Very fair.

1681 d	*April* h	T.3	Bar.		Hy.	Wind.		Weather.
	17	55		4·		S W		Very fair.
9	8	50		3.		S W		Cloſe.
	14	50		2		S W		Rain.
10	11	44		3·		W	2	Clouds, and a little Shower this Morning.
11	17	46		5·		S W	2	Fair ever ſince Yeſterday.
12	15	51		2.		S	3	Fair ſince.
13	14	49		3·		W	2	Fair ſince.
14	13	45		3·		S W	3	Fair ſince.
15	17	54		3·		E N		Cloſe all Day.
16	8	45		3.		E N	1	Miſty.
	17	52		2.		E N	1	A little Shower between 4 and 5.
17	6	49		2.		N E	1	Thick Fog, Showers between 6 and 7 laſt Night.
18	7	46		2·		S W	2	Fair, and Clouds ſince.
May								
3	14	50	29	4.		N E	2	Cloſe, no Rain ſince 18 *April*, but very hot and fair Weather till Yeſterday, the Wind for the moſt part between N and E.
4	10	44		4.		N E	1	Cloſe ſince.
5	8	37		4.		N E	1	Clouds.
6	8	37		2·		E N	1	Fair, Clouds Yeſterday.
	19	46	29			W	1	Cloudy.
7	7	41	28	8·		W N	2	Clouds.
	11	43		8.		W	1	Rain.
	16	47		7.		W	1	Cloſe.

1681	*May*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
8	9	41	29	—	NE 1	Cloudy ſince.
9	9	42	2·	—	EN 1	Fair.
10	4	47	3·	—	N 1	Fair ſince.
11	9	48	3·	—	SE 1	Fair ſince.
	15	61	2·	—	SW 1	Fair ſince.
16	11	54	6·		SW 1	Fair, a little Shower or two ſince.
	18	65	5	—	W 1	Fair ſince.
17	8	55	6·	—	WN 1	Fair ſince.
19	17	70	2·	—	NE 1	Fair ſince.
20	6	64	3·		NE 2	Cloudy, no Rain from hence till *June* 20. the drieſt Spring that hath been known, there having been no Rain from the End of *March* to the End of *June*.
Auguſt						
2	6	65	3·	7	NW 1	Fair.
3	11	60	3·	8	N 1	Fair.
4	9	62	3·	9	W 1	Fair.
5	9	62	3·	8	E 1	Fair.
6	15	71	1·		S 1	Fair.
7	9	68	2	9	S 1	Fair.
	15	72	28 8·	8	SW 2	Cloudy.
8	8	68	7·	9	S 2	Cloſe.
	11	69	7	9	S 2	Rain a little.
9	9	64	8·	10	SW 1	Cloſe.
	17	66	7·	10	S 1	Rain a hard Shower.
10	6	62	7	11	SW 2	Cloſe.
11	9	62	29 1·	11	SW 1	Cloſe.
12	8	66	2	17	SW 1	Miſt.

1681	*Auguſt*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
13	9	69	28 8	18	S 1	Rain.
	14	72	7	17	S W 1	Fair, Clouds.
14	8	67	8.	17	S 1	Fair.
	16	72	6.	16	S E 1	Thunder Shower.
16	9	69	29 2.	17	S W 1	Rain for $\frac{1}{8}$ Hour, and then fair.
17	6	69	2.	16		
18	4	67	3	16		
1682						
February						
10	12	25	29 5		E N 1	Cloſe, Froſt.
11	10	24	29 6		N E 1	Fair, Ice.
12	15	27	29 7.		N E	Very fair.
13	11	24	29 7	61	N E 1	Thick Fog.
14	8	23	29 6	63	N E 1	Fair.
15	8	29	29 5	65	E N 1	Cloſe.
17	8	31	29 0	72	S 2	Cloudy, and ſome Rain.
20	17	42	28 7	75	S E 2	Rain.
21	8	44	28 6	75	S 2	Rainy.
22	9	42	28 7.	77	S 2	Cloſe.
24	10	41	29 2.	74	S E 1	Cloſe.
25	15	39	28 7	75	N E 1	Rain ever ſince Yeſterday in the Afternoon.
26	10	38	29 1	74	N 1	Cloſe.
27	7	37	29 3	75	N W 1	Cloſe.
28	10	39	29 4	73	W 1	Cloſe.

1682	*March*						
d	h	T.3	Bar.	Hy.	Wind.		Weather.
1	9	42	29 3:	74			Fog.
5	16	30	29 1.	67	S	1	Very fair, hard Froſt in the Morning.
6	10	28	29 2.	67	N E	1	Fair.
7	11	25	29 2·	65	N	2	Very fair.
22	13	29	29 2.	57	N	3	Cloudy, and a little Snow.
23	8	25	29 4˙	56	N	2	Cloſe, Froſt.
24	7	29	29 4:	57	W	1	Cloſe.
25	9	36	29 2.	59	N	2	Clouds.
26	8	31	29 4˙	56	N	1	Cloſe.
27	8	34	29 4.	57	W	2	Fair.
	13	39	29 3.	59	W N	1	A Shower.
28	7	35	29 4.	56	N W	1	Fair.
29	7	30	29 5˙	50	N		Clouds.
30	8	30	29 5·	48	N E	2	Fair.
	11	31	29 5˙	47	N E	3	Snow.
31	8	30	29 6.	48	N E	2	Fair.
April							
1	8	30	29 6.	49	N E	2	Cloſe.
2	9	33	29 6.	50	N E	1	Cloſe.
	19	36	29 6.	51	N E	1	Small Miſt.
3	7	34	29 6:	51	N E	1	Small Miſt.
4	9	34	29 6.	50	N E	1	Cloſe.
5	7	34	29 5	50	N E	1	Fog, and Sun-ſhine.
6	9	39	29 4:	49	N	1	Fair.
7	9	39	29 5:	48	N	1	Fair.
8	8	39	29 5˙	44	N E	1	Fog, and Sun-ſhine.

1682	*April*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
	11	43	29 5·	44	SE 2	Fair.
9	7	40	29 3.	40	SE 2	Thick Fog.
	14	41	29 1·	41	S 2	Rain.
	20	43	28 7	44	S 2	Rain till paſt 6, now fair.
10	7	43	28 6·	47	SW 2	Cloſe, Rain in Showers moſt part of the Day.
11	8	43	28 6.	49	SW 2	Cloſe, Rain in Showers moſt part of the Day.
12	7	41	28 5.	48	SW 1	Cloſe, Shower about Noon.
	16	44	28 6·	47	WN 1	Fair.
13	6	37	28 8·	47	SE 1	Fair.
	17	44	28 5·	47	2	Rain.
14	7	42	28 2·	48	SE 2	Rain all the Morning, till paſt 12.
	14	45	28 5·	50	W 3	Rain, more or leſs, almoſt all the Afternoon.
15	6	40	29 1·	50	SW 2	Fair.
16	7	43	29 1·	48		Fair, hard Shower about 18.
17	7	47	28 8·	49	SE 1	Cloſe, Showers ſeveral times in the Day.
18	7	43	28 7·	50	SE 1	Rain the greateſt part of the Day.
19	6	44	28 7.	52	S 2	Cloſe, Rain a great part of the Day.

1682	*April*					
d	h	T. 3	Bar.	Hy.	Wind.	Weather.
20	6	44	28 6.	51	S E 1	Rain, and ſo in Showers ſeveral times of the Day.
21	4	45	28 6·	51	S 1	Cloudy, Rain moſt part of the Morning.
22	8	47	28 7	51	S 1	Rain.
	17	51	28 8·	52	N 1	Rain moſt part of the Afternoon.
23	7	46	29 2·	52	N 1	Cloſe.
	13	49	29 3·	52	S 1	Cloſe, Rain almoſt all the Afternoon.
	22	49	29 3·	52	N *about* 18	Hard Rain.
24	6	46	29 4.	52	E 1	Cloſe, hard Rain at Night.
25	7	47	29 1·	52	ES 1	Cloſe, ſome Rain.
	14	42.	28 8·	53	SE 1	Dropping.
	22	54	28 7.	54	3	Hard Rain from 18.
26	7	52	28 6.	54	S 2	Cloudy, Rain often in the Day.
27	5	52	28 8.	55	SW 1	Cloſe, a good deal of Rain before Night.
28	18	51	28	55	SW 1	Cloſe, Rain a good part of the Morning, and ſome in the Afternoon.
29	8	47	29 1.	55	SW 1	Cloudy, a little Rain in the Afternoon.
30	5	47	28 8·	55	SW 1	Fair.
	18	46	28 6.	55	NE 1	Hard Rain, which began about 11, and laſted till 21 or 22.

1682	*May*						
d	h	T.3	Bar.	Hy.	Wind.		Weather.
1	4	42	28 8.	55	N W	2	Cloudy.
	21	47	29 2.	54	N W	1	Fair.
2	8	43	29 2·	54	S W	1	Cloudy, hard Rain from 19 or 20 all Night.
3	6	49	28 7·	54	S W	2	Clouds, Wind W. all the Afternoon, but fair, bating a little Rain in the Evening.
4	5	52	28 7.	54	S E	1	Rain hard till 13.
	13	54	28 7·	54	N	1	Rain hard till Night.

Memorand. *That new fitting my Barometer, here the Mercury was raiſed by Addition of more in the Receiver about* $\frac{2}{10}$ *Inch, which is almoſt* 2 *of my Degrees, which are Eights, though I ſuſpect it is ſtill by reaſon of included Air, a Degree or two too low.*

	22	53	29 2·	54			Small Rain.
5	8	48	29 3.	54	E	1	Rain.
	20	51	29 3·	55	E	1	Cloſe Rain moſt part of the Morning, and 2 or 3 Showers in the Afternoon.
6	7	48	29 3:	55	N E	1	Miſt.
7	8	46	29 4.	55	E	2	Rain a great part of the Day.
8	4	53	29 2.	56	S W	2	Hard Rain till 7 or 8.
9	10	54	29 1·	55	E	1	Cloſe.
	14	55	29 1·	55	S W	1	Rain.
10	9	50	29 2·	54	S	1	Cloudy, a little Rain about 17, and again about 22.
11	6	49	29 2·	54	S W	1	Cloſe.

1682	*May*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
11	9	50	29 2˙	55	S W 1	Short Shower: ſeveral ſhort Showers in the Afternoon.
12	6	49	29 3.	54	S W 1	Cloſe; a Shower in the Morning.
13	4	51	29 2·	53	E 1	Cloſe, ſeveral Showers in the Day.
14	9	53	29 4·	54	S W 2	Clouds.
15	7	51	29 4˙	51	S 1	Fair.
16	8	61	29 2.	48	S E 1	Fair, hard Shower about 18.
17	5	60	29 3·	48	S W 2	Cloſe.
18	7	57	29 5·	47	W 1	Fair.
19	8	58	29 5.	45	W S 1	Fair.
20	5	63	29 3·	43	S E 1	Fair.
	16	69	29 3·	43	W S 1	Very fair.
21	8	59	29 3˙	44	S 1	Fair.
22	9	69	29 1˙	42	S E 1	Fair.
	17	47	29 1.	38	S W 2	Fair.
23	7	64	29 2˙	38	W 1	Fair, gentle Rain from 8 to 11.
	10	63	29 2˙	38	W 1	Rain.
24	7	62	29 2.	39	N 1	Cloſe.
25	6	59	29 3.	42	N W 1	Fair.
27	9	53	29 5:	42	W 1	Fair.
28	14	67	29 3˙	33	S 1	Fair.
October						
14	9	45	29 6.	49	W 1	Cloſe, Rain laſt Night.
16	13	48	29 4˙	51	S W 2	Rain till Bed-time.

1682	*October*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
17	9	47	29 2.	51	W 1	Fair, little Rain.
18	10	41	29 1.	51	S W 2	Cloudy, hard Rain from 5 to Bed-time.
19	9	39	28 7.	51	W 1	Fair, Shower in the Afternoon.
20	9	34	28 7.	51	0	Rain.
27	22	38	29 7.	60		Cloſe.
28	10	37	29 7.	60	E N 2	Fair.
November						
8	18		29 8.			Fair, hard Froſt.
9	9	22	29 8.	57	N 1	Fog, gone before Noon: hard Froſt.
10	10	26	29 8.	58	E N 1	Fair, hard Froſt.
11	9	25	29 7.	56	N E 1	Cloſe, hard Froſt.
12						Fair, hard Froſt.
13	10	26	29 5.	57	N E 1	Cloſe, hard Froſt.
14	13	23	29 7.	57		Thick Fog, fair in the Afternoon.
15	10	36	29 4.	56	S W 1	Cloſe, Rain this Morning, hard Rain 22.
16	5	41	29 1.	66		Hard Rain, Rain moſt part of the Day.
	17	41	29 1.	65	S W 1	Rain.
17	11	39	29 1.	64	W S 2	Fair.
18	9	37	28 7.	64	0	Fog, Rain moſt part of the Day.
19	9	33	29 1.	62	W 1	Fair, Rain in the Night

1682	*Novemb.*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
20	10	40	29 1.	64	W N 1	Fair, Rain in the Afternoon.
	22	42	29 2.	63	2	Fair.
21	6	42	29 1.	64		Hard Rain till 10.
	16	43	29 2.	64	W 2	Fair.
22	11	33	29 5	63	W 1	Small Fog, Froſt this Morning.
23	9	28	29 5.	62	N W	Fog, thick Fog all Day.
24	9	25	29 5	62	N W	Thick Fog, little Rain in the Evening.
25	8	35	29 3	67	S W 1	Cloſe, Rain in the Evening.
26	9	35	29 4.	65	W N 1	Fair.
27	10	31	29 7.	64	W N 1	Fair.
28	4	32	29 8.	65		Fair.
29	8	33	29 7.	65	W S	Small Fog.
30	9	35	29 7.	65	S W 1	Fair.
December						
1	8	35	29 6.	66	S 1	Miſt.
2	9	34	29 6.	66	S 1	Cloſe.
3	9	34	29 6.	66	S W. 1	Foggy.
1683.	*June*					
21	9	62	29 3.	46	W 1	Cloſe.
22	8	65	29 2.	48	W S 2	Cloſe, ſome Showers.
23	7	59	29 4.	46	W 1	Cloudy.
25	19	67	29 4.	44	W N 1	Fair, Miſt in the Morning.

1683	*June*					
d	h	T.3	Bar.	Hy.	Wind.	Weather.
26	10	64	29 5.	43	S 1	Very fair.
	17	72	29 3˙	43	SW 2	Fair.
30	13	62	29 3˙	37	W N 3	Fair.

An Explication of the foregoing Regiſter.

THE firſt Column with *d* at the Top, contains the Day of the Month.

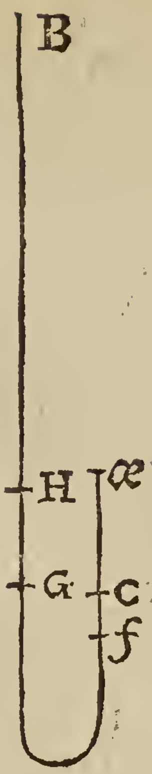
The ſecond Column with *h* at the Top, contains the Hour of the Day, which beginning from Midnight, I count to 24, which is Midnight again; ſo that 13 ſtands for 1 Afternoon, and ſo on.

The third Column with *Th.* at the Top, marks the Degrees of my Thermoſcope, which having been blown at a Lamp, though the Spaces of the Degrees were equally divided, yet becauſe of the unequal Bigneſs of the ſmall Tube, towards the Extremities, where it grew bigger, it did not always in every Degree mark equally proportionable Degrees of Heat and Cold. The Points to be obſerved in that and the next Column, which is that for the Baroſcope, ſhew the juſt Place where the Top of the tinged Spirit of Wine in the one, and the Mercury in the other, ſtood between the Line of the Degree marked, and the following, when the Obſervation was made. The Thermoſcope I made uſe of till *December*, 1669, was a ſeal'd one, with all the Degrees increaſing with the Heat in one continued Series. The Thermoſcope which I uſed from *Decemb.* 1669. to *June* 1675. and is marked 2. was one of Mr. *Cotgraves* adjuſting, which beginning the reckoning from the temper of freezing, hath the Numbers increaſing both upwards and downwards; the Points ſhew it to be in the Degrees; above 0, if ſet over; and under 0, if ſet under: and · ·· or ··· ſhew it higher or lower in each Degree. The Thermoſcope uſed from *March* 1681, to the End, is marked 3, and is of the kind of that uſed firſt.

The Column having *Hy.* at the Top, contains the Degrees of Moiſture, as marked by an Hygroſcope made of the Beard of a wild Oat.

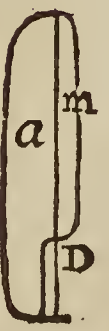
In the Column of the Wind, I not having the Convenience to obſerve the Points exactly, have marked but 8, but yet with this Variety, that where I ſet two Letters, the Wind was moſt from that Point whoſe Letter ſtands firſt, *v.g.* W N ſignifies more Weſt than North. When I ſet only one Letter, it was in or very near that Cardinal Point.

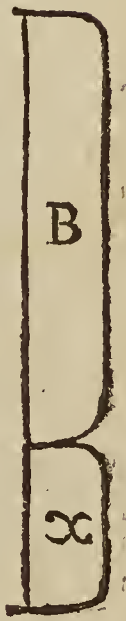
The Strength is marked by 0, 1, 2, 3, 4. 0 ſignifies not ſo much Wind that mov'd any Leaf that I could ſee in a Garden I look'd into out of my Window, but the Letter join'd to it ſignifies which way the Weather-Cock then ſtood, whether the former Wind left it ſo, or the preſent Breeze blew that way. 1 ſignifies a gentle Gale, juſt perceivable by the moving of the Leaves or Plants. 4 ſignifies a very violent Storm: 2 and 3 the ſeveral Degrees between 1 and 4, as well as I could judg. Theſe Degrees, though not ſo exactly meaſured as I could have wiſh'd, I yet thought better than nothing.



LE Tuyau recourbé eſtoit fermé au bout æ et Ouuert alautre extremité B. La recourbure depuis. G. Juſq' a C. eſtoit pleine de Mercure & tout le reſte eſtoit plein d' air. La longueur Æ. C. eſtoit 4 Pouces ou $\frac{32}{8}$. J'echauffay cet air, et il feit baiſſer le Mercure Juſques en f. qui eſtoit $\frac{3}{8}$ plus bas, & en meſme temps il monta juſq' en H. qui eſtoit $\frac{5}{8}$ plus haut que G. ou C.

Pour ſçauoir quélle hauteur de Mercure auroit eſte neceſſaire pour empeſcher la dilatation de lair, & retenir le mercure en C. Je nay quá trouuer ce qui ſeroit neceſſaire pour repouſſer le mercure en C. Etainſy contenir lair dans léſpace Æ. C. non obſtant la Chaleur. Je poſe pour principe ceque lexperience fait voir, Ceſt que quand une quantité dáir occupe un certain eſpace que Jappelle. Æ. et que la preſſion qui leretient dans cet eſpace ſoit B. ſi on vient a augmenter cette preſſion de telle quantité que lón voudra comme X. on diminuera L'eſpace Æ. d'une certain quantité. D. Laquelle quantité eſt au reſtant. M. comme X eſt a B.





D. M: : X. B.
donc
M. D: : B. X.

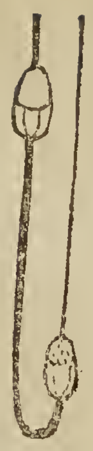
Il eſt aiſé d áppliquer cettereigle à lexperience cy deſſus Car Æ. f. ou $\frac{35}{8}$ de pouce ſont leſpace Æ. La preſſion ordinaire de lâir qui eſt de 30 Pouces Jointe æ un pouce de haut que ſe trouue entre f. et H. eſt B X 31 Pouces de mercure : et ſi nous y en adjouſtons aſſez pour reduire láir a léſpace. Æ. C. Ledit. Æ. C. ſera M. X $\frac{32}{8}$ Et. f. C. Sera D. X $\frac{3}{8}$
Poſant donc. M. D. . B.
32. 3. 31.

La quatrieſme proportionelle ſera. X. X 2 $\frac{29}{32}$ pouces, qui eſtants joints a B. X 31 Pouces feront 33 $\frac{29}{32}$ pouces dont láir ſera preſſé en C. Æ. qui ſont pres de 4 Pouces audeſſus de la preſſion ordinaire.

Experiment made at the Spire of the Cathedral-Church in Sarum, *by Colonel* John Windham, *aſſiſted by Mr.* Tho. Naiſh, *Clerk of the Works, and* John Warner, *in* November, 1684.

HAving gotten together all the ſurveighing Chains the City afforded, and carefully examined their Truth, and having prepared a proper Frame for the Baroſcope, we went into the Church, filled the Tube, and with all the Nicety we could uſe, purged it of the airy Particles, and then immerſing it, as in the Torricellian Experiment, the Mercury was there ſuſpended 30 Inches, and 50 Cents of an Inch, meaſuring it from the Surface of the *Stagnum*: Then drawing it up to the firſt Floor above the Vaulting, which is 1033 Inches and $\frac{1}{2}$ high from the Pavement, the Mercury ſubſided 9 Cents of an Inch: From thence drawing it up to the middle Floor, which is 935 Inches higher, the Mercury ſubſided 8 Cents lower than before: And from thence drawing it up to the Weather-Door, which is 2313 Inches higher than the laſt, the Mercury ſubſided 23 Cents below its laſt Station. So the whole Height 'twas drawn up, is 4281 Inches and a half; and the whole Difference of the Mercury's ſtanding is 40 Cents of an Inch. And letting it down again the ſame way, the Mercury reaſcended to its firſt Stations.

At another time with an inverted Baroſcope, like that Figure in the Margin, having made a Mark where the Liquor ſtood when 'twas below in the Church, and drawing it up to the firſt Floor over the



		Inches.		Inc.	Cen
Vaulting	Which is above the Pavement of the Church	1033 and $\frac{1}{2}$.	The Liquor aſcended	1	25
To the middle Floor		1968.		2	39
To the 8 Doors Floor		2467.		3	22
To the Weather-Door		4281.		5	64
To the Top		4800, or 400 Feet.		6	40

If your Honour deſires to have any other Experiments made at that Spire, Mr. *Naiſh* whom I have mentioned above, is a Perſon well skill'd in the practical Parts of Mathematicks, and a great Lover of Learning, but more eſpecially natural and experimental Philoſophy, having all or moſt of your Honour's Phyloſophical Works. This Perſon I know would moſt gladly and heartily imbrace any Opportunity of ſerving your Honour, whenſoever you'l be pleaſed to let me impart any thing to him in a Letter.

This is humbly advertiſed by, Sir,
Your Honour's moſt Obliged,
and moſt Obedient Servant,

♃ *Decembris* 17.
Anno 1685.

JONH WARNER.

At a Place in the great Continent in *Europe*, but not far from the Ocean, a learned Acquaintance of mine keeping a Baroſcope ſome Years, and being diſcours'd with by me, about the Difference of the Phænomena that may be expected in Places ſituate upon the Continent, from what we find in this Country, as it is an Iſland: He related to me, that a few Years ſince, caſting his Eyes upon the Baroſcope, in ordinary Weather, and that was calm enough; he was ſurprized to ſee the Mercury ſo ſtrangely raiſed, as to exceed above two Inches its wonted Station, which great Alteration he found within few Hours to have been the Fore-runner of ſo hideous a Storm as was generally wondred at, and did a great deal of Miſchief both in the Towns and Country of thoſe Parts, where it left ſad Inſtances of its Fury. This Wind came all along the Continent: but my Relator divers times obſerved, that when very boiſterous Winds blew from the Sea, and the Storms came thence, (which lying to the Southward) the Mercury in the Baroſcope would conſiderably ſubſide, as has likewiſe been often obſerved here in *England* by an ingenious Gentleman, living within leſs than two Leagues of the Sea, to whom I preſented a Baroſcope to make Obſervations with.

An induſtrious young Man, that whilſt he was my Domeſtick, I bred up to Chymiſtry, (of which he now teaches Courſes) related to me the other Day, that toward the latter End of the laſt Month (which was *June*) being at *Oxford*, where his Houſe is, he had occaſion to caſt his Eyes upon his Baroſcope, and was not a little ſurprized to find that the Quick-ſilver was in an extraordinary Meaſure alter'd from the Height it ſtood at but a while before: Whereupon, though the Weather were very hot and fair, as is uſual in *June*, and had continued ſo for ſome Days; yet he took upon him to foretel from this great and quick Subſidence of the Mercury, that there would be e're long ſome notable Change of Weather. And accordingly it happened within about four or five Hours, that the Sky was all overcaſt; and there fell a hideous Storm of Rain, Lightning and Thunder, accompanied with ſuch a Whirlwind,

wind, as ſcarce any remember to have ſeen in that City.

A Letter to the Author.

Honoured Sir,

I Have been able to do ſo little in the Attempts I have made to ſerve you, that I am aſhamed to have been ſo well furniſhed to ſo ſmall purpoſe. The Barometer I had from you was conveyed ſafe into the Country, and as ſoon as it came to my Hands, I rode to *Minedeep*, with an Intention to make uſe of it there, in one of the deepeſt Gruffs (for ſo they call their Pits) I could find: the deepeſt I could hear of was about 30 Fathom, but the Deſcent ſo far either from eaſy, ſafe, or perpendicular, that I was diſcouraged from venturing on it. They do not, as in Wells, ſink their Pits ſtrait down, but, as the Cranies of the Rocks, give them the eaſieſt Paſſage; neither are they let down by a Rope, but taking the Rope under their Arm, by ſetting their Hands and Legs againſt the ſides of the narrow Paſſage, clamber up and down, which is not very eaſy for one not uſed to it, and almoſt impoſſible to carry down the Barometer, both the Hands being imployed. This Information I ſhould have ſuſpected to come from their Fear, had not an intelligent Gentleman, Neighbour to the Hill, aſſured me 'twas their uſual way of getting up and down. For the Sight of the Engine, and my Deſire of going down into ſome of their Gruffs, gave them terrible Apprehenſions, and I could not perſwade them but that I had ſome Deſign: So that I and a Gentleman that bore me Company, had a pleaſant Scene, whilſt their Fear to be undermined by us, made them disbelieve all we told them; and do what we could, they would think us craftier Fellows than we were. But, Sir, I will not trouble you with the Particulars of this Adventure: but certain it is the Women too were alarm'd, and think us ſtill either Projectors or Conjurers. Since I could not get down into their Gruffs, I made it my Buſineſs to inquire what I could concerning them: The Workmen could give me very little Account of any thing, but what Profit made them ſeek after; they could apprehend no other Minerals but Lead Oar, and believed the Earth held nothing elſe worth ſeeking for: beſides, they were not forward to be too communicative to one, they thought they had Reaſon to be afraid of. But at my Return, calling at a Gentleman's Houſe, who lives under *Minedeep*-Hills, and who had ſent out his Son to invite me in; amongſt other things he told me this, that ſometimes the Damps catch them, and then if they cannot get out ſoon enough, they fall into a Swound, and die in it, if they are not ſpeedily got out; and as ſoon as they have them above ground, they dig a Hole in the Earth, and there put in their Faces, and cover them cloſe up with Turfs; and this is the ſureſt Remedy they have yet found to recover them. In deep Pits they convey down Air by the ſide of the Gruff, in a little Paſſage from the Top; and that the Air may circulate the better, they ſet up ſome Turfs on the Lee ſide of the Hole, to catch, and ſo force down the freſh Air: But if theſe Turfs be removed to the windy ſide, or laid cloſe over the Mouth of the Hole, thoſe below find it immediately, by want of Breath, Indiſpoſition, and Fainting: and if they chance to have any ſweet Flowers with them, they do not only loſe their pleaſant Smell immediately, but ſtink as bad as Carrion. Notwithſtanding this ill Succeſs, I had attempted ſome Trials once more, had not the ſpreading of the Contagion made it leſs ſafe to venture abroad, and haſtened me out of the Country ſooner than I intended. But I have ſome Hopes, the next Journey I make into thoſe Parts, to give you a better Account than this that follows. Near the Houſe where I ſometimes abode, was a pretty ſteep and high Hill. *April.* 3. *hora inter* 8 *&* 9. *Matutin.* the Wind Weſt, and pretty high, the Day warm, the Mercury was at 29 Inches and $\frac{1}{8}$, being carried up to the Top of the Hill, it fell to 28 Inches $\frac{3}{4}$, (or thereabouts, for I think it was a little above 28 Inches $\frac{3}{4}$:) Both going up and coming down, I obſerved that proportionably as I was higher or lower on the Hill, the Mercury fell or roſe. At my return to the bottom of the Hill, the Mercury wanted of aſcending to its former Height $\frac{1}{32}$ of an Inch, which I impute to the Sun's rarifying ſome Particles of Air that remained in the upper Part of the Tube, rather than to any other Change in the Air; for I find it harder to clear the Tube of Air perfectly, than at firſt I thought, or of Water, if that have been put in with the Mercury, and I fear liable to the ſame Inconvenience with Air incloſed. I know this is far ſhort of what you might have expected, and has, I fear, but little anſwered your Deſires, ſince I gueſs it was the perpendicular Height of the Place I made the Experiment in, that you would have had, and perhaps other Conſiderations of Air, incloſed, and liable to mineral Steams, would have made a Trial in one of the Gruffs more acceptable to you. I do not think any thing in this Letter worthy of you, or fit for the Publick. But ſince I find by the two laſt Philoſophical Tranſactions, that Obſervations on the Torricellian Experiment are much look'd after, and deſired to be compared; if for want of better, this ſhould be thought fit to fill an empty Space in the Philoſophical News-Book, I ſhall deſire to have my Name concealed. But I fear that this very Caution of being in Print, where there is no Danger of it, has too much of Vanity in it. I'm ſure 'tis Boldneſs enough, though allaid with Obedience, to venture ſuch ſlight things to your Sight. I viſited the incruſting Spring I formerly mentioned to you, and could not find any thing incruſted within at leaſt 20 Yards of the Riſe of it. The Place where it works moſt, is about 40 or 50 Yards from the Spring-head, and is at a Fall higher than my Head: there it ſheaths every thing with ſtony Caſes, and makes the ſides of the Bank hard Rock, and from thence all along its Stream, it covers Sticks, *&c.* with a Cruſt; and ſome ſo candied I found above this Fall, but not ſo frequent; whether the mixing of Air with the Water in the Fall, contributes any thing to the Effect, I cannot gueſs; but that the Fall does, I ſuppoſe: for beſides that at the above-mentioned Fall, it ſeems to operate moſt ſtrongly, I obſerved, that though I could not find any thing incruſted within a good Diſtance of the Spring, yet that the Moſs above the Spring was a little incruſted, (but not ſo firmly as at the other Place) for the Water in the Winter, when the Springs are full, runs out alſo at a Hole two or three Yards above the Place, where now only it riſes, and from thence falls perpendicularly into this lower Spring, from whence it runs by an eaſy Deſcent to the next Fall. A Gentleman in whoſe Field it riſes, and by whoſe Houſe it runs, told me upon Inquiry, that he uſes it both in his Kitchen and Brew-houſe, without any ſenſible ill Effects, he being a pretty ancient, but healthy Man, and long Inhabitant of that Place. It will bear Soap, freezes quickly; and waters his Grounds upon Occaſion, with Advantage. All the ill Effects of it, that he can gueſs, are, that his Horſes are uſually ſhort-breathed, which he imputes to the drinking of that Water. I brought with me from *Minedeepe* ſome Oar, and ſome Stones; but I think them ſo inconſiderable, that I ſhall not judg them worth ſending, unleſs you pleaſe to command them. I am, *SIR*,

Your moſt Humble
and moſt Obedient Servant,

Ch. Ch. 5° *May*,
1666.

JOHN LOCKE.

POSTSCRIPT.

I had forgot to mention to you, that in their Gruffs, after burning, (when they meet with hard Rocks in their way, they make a Fire upon them, that they may dig through the eaſier) they find it very dangerous to go down into them, as long as there remains any Fire or Heat in any Chinks of the Rocks.

Some Days ago the King doing me the Honour to diſcourſe with me about the Uſe of Baroſcopes, was pleaſed to ſay, among other remarkable things, that at a time his Majeſty then named, he went from *Whitehall* about ſix in the Morning, towards the Mouth of the River, attended by divers of the Nobility, and particularly by one of the Lords then preſent, whom his Majeſty put in Mind of the Adventure; and then he added, that though the Weather were exceeding fair, and likely to continue ſo, inſomuch that ſome of the Courtiers congratulated to his Majeſty ſo promiſing a Morning; yet when they were once gone too far to re-

turn, he told them he thought they would be much miſtaken, and that they were to prepare for a Storm; which Conjecture his Majeſty grounded upon his having, unknown to the Company, conſulted a good Baroſcope before he went out, and found the Mercury in it to have ſuddenly, and very notably ſubſided. And accordingly within a very few Hours the Event verified his Majeſty's Prediction, a ſudden Storm driving on the Yatch he was in, for divers Leagues, at a very unuſual rate.

Nous apprenons de ces experiences, que puiſque le poids de l' Air et le poids de l' eau qui eſt dans les Pompes ſe tiennent mutuellement en Equilibre, ils peſent preciſement autant l' un que l' autre; & qu' ainſi en connoiſſant la hauteur ou l' eau s' éleve en tous les lieux du monde, nous connoiſſons en meſme temps combien chacun de ces lieux eſt preſſé par le poids de l' Air qui eſt au deſſus d' eux; et partant.

Que les lieux, qui ſont au bord de la mer, ſont preſſez par le poids de l' Air, qui eſt au deſſus d' eux juſques au haut de ſa Sphere, autant preciſement, que ſi au lieu de cét Air on ſubſtituoit une colomne d' eau de la hauteur de 31 Pieds deux poulces.

Ceux qui ſont plus élevez de dix toiſes, autant que s' ils portoient de l' eau de la hauteur de 31 Pieds un poulce.

Ceux qui ſont élevez au deſſus de la mer de 500 Toiſes, autant que s' ils portoient de l' eau à la hauteur de 26 Pieds onze poulces: & ainſi du reſte.

Nous apprenons par ces experiences que l' Air qui eſt ſur le niveau de la mer peſe autant que l' eau, à la hauteur de 31 Pieds deux poulces; mais parce que l' Air peſe moins ſur les lieux plus élevez que ſur le niveau de la mer; et qu'ainſi il ne peſe pas ſur tous les Points de la terre egalement, & meſme qu' il peſe differemment par tout, on ne peut pas prendre un pied fixe, qui marque combien tous les lieux du monde ſont Chargez par l' Air, le fort portant le foible; mais on peut en prendre un par conjecture bien approchant du juſte; comme par exemple, on peut faire eſtat, que tous les lieux de la terre en general conſiderez comme s' ils eſtoient également chargez d' Air, le fort portant le foible, en ſont autant preſſez, que s' ils partoient de l' eau à la hauteur de 31 Pieds; et il eſt certain qu' il n' y a pas un demy pied d' eau d' erreur en cette Suppoſition.

Or nous avons veu que l' Air qui eſt au deſſus des montagnes hautes de 500. toiſes ſur le niveau de la mer, peſe autant que l' eau à la hauteur de 26 Pieds 11 Poulces.

Et par conſequent tout l' Air qui s' étend depuis le niveau de la mer juſqu' au haut des montagnes, hautes de 500 Toiſes, peſe autant que l' eau à la hauteur de 4 Pieds un poulce, qui eſtant à peu prés la ſeptiéme partie de la hauteur entiere; il eſt viſible que l' Air compris depuis la mer juſques à ces montagnes eſt à peu pres la ſeptiéme partie de la maſſe entiere de l' Air.

Nous apprenons de ces meſmes Experiences, que les vapeurs qui ſont épaiſſes dans l' Air, lors qu' il en eſt le plus Chargé, peſent autant que l' eau à la hauteur d' un pied huit Poulces; puiſque pour les contrepeſer, elles font houſſer l' eau dans les Pompes à cette hauteur, par deſſus celle ou l' eau contrepeſoit déja la peſanteur de l' Air: de ſorte que ſi toutes les vapeurs qui ſont ſur une contrée eſtoient reduites en eau, comme il arrive quand elles ſe changent en pluye, elles ne pourroient produire que cette hauteur d' un pied huit poulces d' eau ſur cette contrée. Et s' il arrive par fois des orages ou l' eau de la pluye qui tombe vienne à une plus grande hauteur; c' eſt parce que le vent y porte les vapeurs des contrées voiſines.

Nous voyons auſſi de là, que ſi toute la Sphere de l' Air eſtoit preſſée & comprimée contre la terre par une Force qui la pouſſant par le haut, la reduiſiſt en bas à la moindre place qu' elle puiſſe occuper, & qu' elle la reduiſiſt comme en l' eau, elle auroit alors la hauteur de 31 Pieds ſeulement.

Et par conſequent qu' il faut conſiderer toute la maſſe de l' Air en l' eſtat libre ou elle eſt, de la meſme ſorte que ſi elle euſt eſte autrefois comme une maſſe d' eau de 31 pieds de haut á l' entour de toute la terre, qui euſt eſté rarefiée et dilatée extremement, et convertie en cet eſtat ou nous l' appellons Air, auquel elle occupe à la verite plus de place, mais auquel elle conſerve preciſement le meſme poids que l' eau à 31 pieds de haut.

Et comme il n' y auroit rien de plus aiſé que de ſupputer combien l' eau qui environneroit toute la terre à 31 Pieds de haut peſeroit de livres; et qu' un enfant qui ſcait l' Addition et la Souſtraction le pourroit faire; on trouveroit par le meſme moyen combien tout l' Air de la Nature peſe de liures, puiſque c' eſt la meſme choſe; et ſi on en fait l' épreuve, on trouvera qu' il peſe à peu prés huit Millions de Millions de Millions de Liures.

I' ay voulu avoir ce plaiſir, et j' en ay fait le compte en cette ſorte.

I' ay ſuppoſé que le Diametre d' un cercle eſt à ſa circonference, comme 7 á 22.

I' ay ſuppoſe que le Diametre d' une Sphere eſtant multiplié par la circonference de ſon grand cercle, le produit eſt le contenu de la ſuperficie Spherique.

Nous Scavons qu' on a diviſe le tour de la terre en 360 degrez. cette diviſion à eſté voluntaire, car on l' euſt diviſée en plus ou moins ſi on euſt voulu, auſſi bien que les cercles celeſtes.

On a trouve que chacun de ces degrez contient 50000 toiſes.

Les lieues autour de Paris ſont de 2500 toiſes; et par conſequent il y a 20 lieues au degré: D'autres en comptent 25 mais auſſi ils ne mettent que 2000 toiſes à la lieue; ce qui revient à la meſme choſe.

Chaque toiſe a 6 pieds.

Un pied Cube d' eau peſe 72 libres.

Cela poſé, il eſt bien aiſe de faire la ſupputation qu' on cherche.

Car puiſque la terre a pour ſon grand cercle, ou pour ſa circonference · · · · · · · · · · · · · 360 degrez.

Elle a par conſequent de tour · · · · · · · · · · · · · · · 7200 lieues.

Et par la proportion de la Circonference au Diametre aura · · · · · · · · · · · · · 2291 lieues.

Donc en multipliant le Diametre de la terre par la Circonference de ſon grand cercle; on trouvera qu' elle á en toute ſa ſuperficie Spherique · · · · · · · · 1649200 lieues quarrées.

C' eſt à dire · 103, 095, 000, 000, 000, toiſes quarr.

C' eſt à dire · 3711, 420, 000, 000, 000, pieds quarr.

Et parce qu' un pied cube d' eau peſe 72 livres.

Ils' enſuit qu' un priſme d' eau d' un pied quarre de baſe, et de 31 pieds de haut, peſe 2232 livres.

Donc ſi la terre eſtoit couverte d' eau juſques à la hauteur de 31 pieds; il y auroit autant de priſmes d' eau de 31 Pieds de haut, qu' elle a de pieds quarrez en toute ſa ſurface. (Ie ſcay bien que ce ne ſeroient pas des priſmes, mais des ſecteurs de Sphere; et je neglige exprés cette Preciſion.)

Et partant elle porteroit autant de 2232 livres d'eau, qu'elle a de pieds quarrez en toute ſa ſurface.

Donc cette maſſe d' eau entiere peſeroit.

8283, 889, 440, 000, 000, 000, livres.

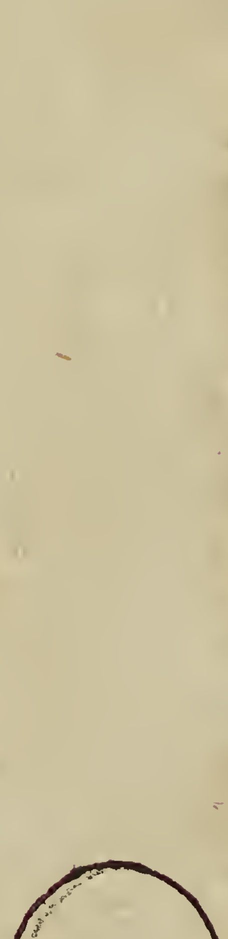
Donc toute la maſſe entiere de la Sphere de l' Air qui eſt au monde, peſe ce meſme poids de

8283. 889, 440, 000, 000, 000, livres.

C'eſt à dire, Huit Millions de Millions de Millions, deux cent quatre vingt trois mille huit cent quatre vingt neuf Millions de Millions, quatre cent quarente mille millions de livres.

Mr. *Paſcal* in his ſmall Tract, either *De la Peſanteur de l'air*; or in that *De l'Equilibre des liqueurs.*

De cætero, feci haud ita pridem experimentum ponderandi aeris, quod pulchrè ſucceſſit; nam ſumptâ vitreâ lagenâ, valde levi et ad lampadem ſufflatâ, ejus figuræ, qualem hic excuſam vides, magnitudine parvæ pilæ quales habentur in ſphæriſteriis, non habente niſi minimam quandam aperturam per quam immittatur pilus in extremitate orificii ſui B. ponderavi eam in bilance valde exacta, & frigida pondus habuit 78 granorum cum dimidio: Poſtea calefeci eam carbonibus impoſitam, & repoſui in bilancem eo ſitu quo hic deſcriptum vides, nimirum orificio in imum verſo, & deprehendi eam vix habere pondus 78 granorum, tum immergendo orificium in aquam, refrigeſcere feci, & dum aer ſe condenſat pro modo quo refrigeſcit lagena, intravit tantundem aquæ quantum aeris calor antea expulerat; denique ponderans eam cum omni illa aqua depre-



hendi eam habere pondus 72 granorum & dimidii plus quamantea : unde concludo aerem qui per ignem expulſus erat, ſe habere ad aquam quæ in locum ſuum regreſſa erat uti $\frac{1}{2}$ ſe habet ad 72$\frac{1}{2}$, aut uti ſe habet 1. ad 145. ſed potui in eo erraſſe difficile quippe eſt in ea re omnino exactum eſſe ; Id ſaltem certò ſcio, quòd pondus aeris hoc modo ſit ſenſibile, & prolixe hic deduxi proceſſum meum, ut ſi te eadem curioſitas inceſſat, poſſis id eodem modo perficere experimentum. Vale.

TITLE XVIII.

Of the Conſiſtency *of the Air; its Rarity, Denſity, Fluidity, Subtilty.*

A Thin but large Bladder, wherein there was about the third part of the Air it was capable of containing, being ſtrongly tied at the Neck, and at the oppoſite Part ſuſpended and clog'd at the bottom, with a Weight of 14 Pound, ſo that it reſted on the Floor, which ſuſtained it; the Strings that tied the Bladder were well ſtretch'd before, and could not ſhrink a quarter of an Inch without drawing up the Weight. Then two Fire-ſhovels, with ſmall Coals and Aſhes were applied at a convenient Diſtance, and kept moving to warm and rarify the included Air, without cracking the Bladder, by which means after ſome of the Wrinckles of the Bladder had been diſplayed, not without Noiſe, the Air being expanded, and conſequently the Bladder a little ſwell'd, and the whole String ſhorten'd, the Weight was raiſed and made to ſwing like a Pendulum. The ſame Experiment being tried two or three times with a quarter of an Hundred, ſucceeded not, though with larger Bladders, the Heat ſtill either breaking the Bladder with Noiſe, or occaſioning ſome little Leak which hinder'd the deſir'd Succeſs, though once we came ſo very near it, that 'tis ſcarce to be doubted, that if we had had good Accommodations, it would have ſucceeded well, and that perhaps if the Weight had been greater.

To try whether the Corpuſcles of the Air would dive into a Liquor that was expoſed but to the ordinary Preſſure of the free Air or Atmoſphere. We cover'd the bottom of a Cylindrical Vial with Filings of Copper, and then pour'd on it an urinous Spirit, to the Height of about three Fingers breadth, and on this Liquor we poured Oil of Almonds to the Thickneſs of a Crown Piece of Silver, or that of about the fifth part of an Inch; then we ſtopp'd the Vial well, and left it in a quiet Place for ſeveral Days. The Event was ſuch as we expected, namely, that the urinous Liquor did firſt acquire, and then loſe a blew Tincture, both were done but ſlowly. And when the Colour was pretty well loſt (for the Liquor was not clear, but ſomewhat troubled) we took out the Cork, and kept the Vial unſtopp'd for one Minute of an Hour, and then ſtopp'd it again; that in that ſhort time the upper Part of the urinous Spirit began to be ting'd with Blew, and within an Hour, though the Veſſel were all the while kept ſtopp'd, the Sky-Colour reach'd to the lower part of the Liquor, which at this time is wholly and deeply of that Colour, the Oil that ſwims above it being clear.

TITLE XIX.

Of the Heat *and* Coldneſs *of the Air.*

THough the Peripatetick Doctrine about the Limits and Temperaments of the three Regions, into which they divide the Air, hath been ſo plauſibly propoſed, that it has been readily entertained, not only by the Ariſtotelian Schools, but by the Generality of Philoſophers, as well modern as ancient: yet ſince I think it becomes a Naturaliſt to conſider, not ſo much how eaſy a Doctrine is, by reaſon of its Concinnity, to be *remembred* or *ſuppoſed*, as how ſtrongly 'tis to be *proved*. I muſt not diſſemble, that as to this vulgar Theory, I think it fitter we ſhould wiſh it to be true, than that we ſhould believe it is ſo: for I confeſs, that upon the beſt Informations I have been able to procure from Travellers by Land and Sea, or from Writers that relate rather what they have obſerved, than what they have been taught, I have been much tempted to queſtion the received Doctrine of the Schools, about the Regions of the Air. And that you may judg, whether or no my Thoughts be rational, the enſuing Diſcourſe ſhall acquaint you with ſeveral of the Particulars on which they are grounded.

What I have in other Papers written concerning Cold, does not only make it leſs proper for me to treat of it indefinitely in this Place, but would make it difficult for me to ſay much on this Subject without Repetition. And it were perhaps fitteſt for me to ſay nothing on an occaſion wherein I have left my ſelf little to ſay that is new and pertinent; but yet ſince this Title promiſes not any thing about Cold in general, but only ſome leſs heeded Particulars, relating to the Coldneſs of the Air: That I may not leave it wholly unfurniſhed, I will refer to it a few Inſtances that enſue.

The Phyſician, elſewhere mentioned, that was lately at *Morocco*, anſwered me, that notwithſtanding the exceſſive Heat that reign'd there in the Day-time, he felt the Night very cold, and ſo he did the mountanous Air in thoſe Parts.

An intelligent Gentleman that ſtay'd a Year in *Guinea*, and ſpent part of that time in the Land, anſwer'd me, that notwithſtanding the exceſſive Heat of the Climate, he was divers times about four of the Clock in the Morning, reduced to be ready to tremble for Cold, as he lay in his Hammock, for about an Hour together.

A learned Man that lived at *Jamaica*, aſſured me, that when he laid in his Hammock, about three or four Foot from the Ground, though he had much Clothes under him, and little or none over him, he felt it cold beneath, and hot above.

'Tis obvious to every Man's Senſe or Obſervation, that the greater Heat that is uſually found in our Air, during the Summer, than in other Seaſons of the Year, has manifeſt Effects upon ſuch eaſily agitable Bodies as Liquors, and upon the Juices and Fleſh of Animals, and the ſofter Parts of Vegetables. Bnt that even in Places ſhelter'd from the Sun-beams, the Warmth of a temperate Summer ſhould be able ſenſibly to rarify and expand ſo cold and compact a Body, as Glaſs it ſelf, would not be eaſily ſuſpected or believed. And yet that this is one of the Effects of the Temperature of the Air in Summer, ſeems very probable by this Experiment,

riment, that having two large factitious Cryſtal Viols, cauſed ſome Stopples of the ſame Matter to be exquiſitely ground, and fitted this or that Veſſel, exactly cloſed when the Stopple was in it, was very eaſy to be opened in Winter, and in the colder Parts of the Neighbouring Seaſons; but in Summer 'twas oftentimes ſo difficult to unſtop the ſame Veſſel, that a Man's Force, though aſſiſted with a String, was not able to pull out the Stopple: ſo that I was often reduced to cauſe the Necks of the Vials to be held under a Pump, or to be ſtirred to and fro in a Veſſel full of Water, that the Coldneſs of that Liquor might take off the Expanſion that the Heat of the Seaſon had given the Glaſs, which being by this means made to ſhrink into its former Dimenſions, the Vial and Stopple would be eaſily enough disjoined. This was tried in ſeveral Veſſels, and in more than one Year. But to make this Experiment ſucceſsful, two Parts muſt at firſt have been exquiſitly adjuſted to one another, which in thoſe Glaſſes, with Stopples of the ſame Matter that are commonly ſold, they are not uſually found to be.

We are wont to attribute the Effects we feel of the Summers Heat, to the bare Warmth of the Air, and to the Agitations that ſuch Warmth produces in the Parts of our Bodies, eſpecially in the Blood, Juices and Spirits, whereas it may very well happen, that we may find odd Changes in our ſelves, upon very hot Weather, which proceed not from the Heat of the Air, as ſuch, but rather from this Cauſe, that by ſuch a Degree of Heat, divers Bodies that we think not of, may be ſolicited to ſend forth *Effluvia* that have emitted none by Force, or at leaſt no ſuch Quantity as could make them ſenſibly operative. And theſe *Effluvia* may be the true and immediate Cauſes of divers Effects that are unwarily aſcribed to the mere Heat of the Air, and that which it produces in our Bodies. To illuſtrate and confirm this Conjecture, I ſhall propoſe the following Experiment.

Being in the Heat of Summer in the Country, I took a ſome-what large Piece of fine Amber, that I uſually imployed about Electrical Experiments; and when the Sun had reach'd a conſiderable Height above the Horizon, I placed it in a ſhaded Part of a Window, on which he ſhined freely, though I left the Amber here for a competent time, yet I could not find that it would draw a Piece of Straw, Feather, or other light Body, that at a convenient Diſtance was held to it. But when I removed it a very little further into a Part of the Window, into which the Sun-beams fell freely, they quickly put its Parts into ſuch an Agitation as made it emit Electrical *Effluvia*, and readily attract thoſe light Bodies that would not ſtir before, and which it would ſoon, though not immediately, loſe the Power of drawing, as before, if it were removed back into the neighbouring ſhaded part of the Window.

May 26. Mr. *Nickſon*, who was four Years Governour of the Engliſh Colony in *Hudſons-Bay*, anſwered me, that when they ſail'd within a certain Diſtance of floating Iſlands of Ice, if the Wind blew from thence toward the Ship, or as the Seamen ſpeak, if they were to the Leeward of the Ice, they could by the new and ſenſible Cold they felt, know that ſuch Ice lay to Windward of them, ſometimes even before they were able to diſcover it by Sight. And when I further asked, at what Diſtance that might be, he anſwered, that 'twas ſometimes twelve or fifteen Miles, if not twenty. He added, that uſually when the Wind blew from thoſe great Maſſes of congealed Water, it brought along with it a foggy Air, which he ſuppoſed to come (as well as the Cold) from the Ice.

The ſame Gentleman, anſwer'd me, that in that Part of *Hudſons-Bay* wherein he winter'd, the Rivers began to freeze about the latter end of *October*, or beginning of *November*, and uſually were not free from Ice till about the middle or latter end of *May*, though he divers times took the Latitude of *Charleton Iſland*, the Place moſt frequented by the Engliſh, and ſeated at the bottom of the Bay, and found it to be near the ſame with that of *London*, and at moſt but about 52 Degrees.

When I inquired about the Depth of the Ice in the Rivers, he anſwered, that they had often occaſion to obſerve it; for in the Winter they made their Wells there, (not in the Ground) and were obliged to dig about ſix Foot deep in the Ice, before they could come at unfrozen Water.

He anſwered me, that when they ſent their Men up into the Country, their Bottles of Brandy would oftentimes ſo freeze, that about a fourth Part of it would be turned into Ice. And when I asked, whether the unfrozen Part of the Liquor was not exceeding ſtrong, he anſwered me, that it was, and ſometimes ſo much ſo, as to be too fiery and unpleaſant to the Taſte.

He anſwered me, that he always found the Ice freſh that floated upon the Sea-Water; and that when they wanted freſh Water, or had a Mind to ſpare what they had aboard, they often ſupplied themſelves out of the Cavities of great floating Maſſes of Ice; in which hollow Places the Sun-Beams thawing ſome Parts of the Ice, they frequently found ſtore of Liquor that was produced by the Action of the Sun-Beams upon the ſuperior Parts of the Ice, whence the Water ran into theſe Cavities. He added, that when the Seamen were in haſte, they uſed to relieve themſelves by cutting or breaking off Pieces of the floating Ice, and preſently melting it in their Pots.

A learned Traveller, that made ſome conſiderable ſtay among the high Pyrenean Mountains, anſwer'd me, amongſt other notable things, about which I made Inquiry, that he had ſeveral times obſerved at the Top of one or other of thoſe tall Hills, that the Air would be very hot, and that yet the ſame Day, and perhaps within very few Hours, the Place would be cover'd with Snow, though it were then Summer-time.

Doctor *N.* anſwered me, that the Winds he felt at *Morocco* were ſo very hot, that they were ready to ſtifle him, ſeeming to him like the Steams and Smoak coming out of the Mouth of an Oven.

The Ruſſian Emperor's Phyſician confirmed to me, that at *Arch-angel* (where he was more than once) they averr'd to him, that in Winter-time a Northerly Wind (which comes from the Sea) produces a kind of Thaw, ſo as to make the Eves drop, though a North-Eaſt Wind rather confirms the Froſt; but on the contrary, a Southerly Wind blows over a thouſand or a hundred Mile of frozen Land, does rather increaſe the Froſt than bring the Thaw.

A very inquiſitive Perſon that viſited the lofty Pyrenean Mountains, anſwered me, that he and his Company had more than once obſerved, from the Top or higher Part of one of thoſe Hills, that though it were fair Weather there, yet a great way beneath them, the Hill was ſurrounded with thick Clouds, which produced Storms of Rain on the lower Grounds: and that (which was the chief Point I inquired after) they could manifeſtly ſee, that out of thoſe Clouds, when it thunder'd, Lightnings flaſh'd upwards, as well as they are generally obſerv'd to do it downward.

October 19. Doctor *Stubbs* aſſured me, that having at *Jamaica* taken a Bolt-head about two Foot and a half in length, he uſually found that betwixt 7 and 8 in the Morning, which they there call the faint time (of the Day) becauſe for want of the daily Breezes, the exceſſive Heat makes them to faint away ; the Water was wont to riſe in the Neck but a quarter of an Inch and a half, though at that time by reaſon of the Winds, Men found the Heat very ſupportable : and after Noon was paſt, the Water would ſubſide by Degrees till towards the above-mention'd time the next Morning. This happened in a South Window, where the freſh Winds come fully and freely in to beat upon the Bolt-head, without any Glaſs to skreen the Veſſel from the Wind.

He added, that though the Bolt-head were not ſtopped, yet the Water did not even in that hot Country decreaſe ſenſibly in eight or ten Months.

A heedful Perſon that frequented the Coaſt of *Sumatra* in the South-Sea, anſwered me, that he never obſerved Ice or Froſt, or Snow, in that great Iſland, but that he had known Hail fall even in that torrid Climate.

Though the famous Iſland of *Ceylon* lies almoſt in the midſt of the torrid Zone, namely, between the *6th* and 10*th* Degrees of Northern Latitude, yet an obſerving Man that lived many Years upon it, told me, that in Hills not ſo high, but that we might eaſily aſcend to the Top in half an Hour, the Inequality of the Air's Temperature, as to Heat and Cold, was very great : for he had divers times obſerved in himſelf and others, that though at the bottom of the Hill the Heat was ſo great, as to oblige them to go almoſt ſtark naked, yet when they aſcended the Hill, they found the Air quite alter'd ; and as they went up higher and higher, the Cold increaſed upon them ; ſo that notwithſtanding the Heat, ſo uneaſy a Motion as Climbing, had given them, the Coldneſs of the Air obliged them to put on unuſually warm Clothes ; and at the Top of the Hill they would for all that be ready to quake for Cold.

Captain *Knox* anſwered me, that in 18 Years that he ſpent in the Inland of *Ceylon*, he never obſerv'd any Ice or Snow, nor any more than a little kind of Meteor that was between Dew and hoar Froſt, which ſometimes in Winter-Mornings appeared very oddly, but quickly vaniſhed. And when I asked if he had not ſeen Hail it ſelf ; he anſwered, that he never ſaw it but once, but the Inhabitants look'd upon it as a wonderful thing, unſeen by them before, that the Hail was as large as a black Cherry, but not very round, and ſeem'd to have the Corners melted, which made him think it had been form'd high in the Air ; that for fear of miſtaking, he not only gather'd ſome of it, but champ'd it between his Teeth, and found it cold and hard, like our European Hail ; and that he was fain to be nimble in making his Trials, becauſe when the Hail came to touch the Ground, it would melt away much more ſuddenly than one would have expected.

Gregory being ask'd, upon a very ſultry Day, whether it were not very hot in *Germany*, made Anſwer, To Day has been ſomething hot : Such is the Winter in *Suaquena*. Ludolf. *Hiſt of* Ethiop. *l.* 1. *c.* 5.

The Heat of the Iſland *Suaquena*, *Gregory* uſed to call *Infernal : For*, ſays he, *it excoriates the Skin* ; melts hard Indian Wax in a Cabinet, and ſears your Shooes like a red hot Iron. Ludolp. *Hiſt. of* Ethiop. *l.* 1. *c.* 5.

The higher you aſcend the Mountains of *Ethiopia* from the Coaſt of the red Sea, the more temperate you Ludolp. *Hiſt. of* Ethiop. *l.* 1. *c.* 5.

ſhall feel the Air, inſomuch, that as *Tellezius* witneſſes, in many Regions of *Ethiopia* the Summer-Heats are more mild than in *Portugal*, ſo many Degrees diſtant toward the North; nay there are ſome Mountainous Countries, as in *Samen*, where the Cold is more dreaded than the Heat. Nevertheleſs there falls none or very little Snow in theſe Parts, only a certain ſmall ſort of Hail ſometimes covers the Ground, which at a Diſtance looks like Snow.

An intelligent Perſon, that was for many Years Conſul of the Engliſh Nation at *Tripoli* in *Barbary*, being asked ſome Queſtions about the Air, and the Winds in thoſe Parts, anſwered me, that when in Summer-time the Wind blew over the great Sandy Deſerts that reach very far into the Country, the Wind, and the Sand it brought along with it, oftentimes felt as hot as the Steams that come out of an Oven when the Mouth is opened, inſomuch that he could not, without great Inconvenience, turn his Face towards the Quarter whence the Wind blew.

An ingenious Gentleman, that was imployed in the French Colony, on the Coaſt of *Africk*, and liv'd in thoſe Parts about five Years, anſwered me, that in the Iſland of St. *Lovis*, or near it, at a certain Seaſon of the Year, when the hot Winds blew from the Continent, the Sand on the Shores would be ſo ſcorching hot, that he was not able to ſtand upon it, but it would, through the Soles of his Shooes, ſcorch his Feet, unleſs he walked very faſt. And then the Air ſeem'd to him to be thick, and as he expreſſed it, heavy and hot, as if it came out of an Oven. And when the Wind blew from a Wood, where divers Elephants and other wild Beaſts lay dead; the Steams of their Carcaſſes would make the Air ſo ſtinking and offenſive, that is was ſcarce ſupportable.

In ſummo ejus montis, Idæ ſc. faſtigio ſacellum eſt quod ædificiolo duntaxat conſtat ſaxis ſibi invicem impoſitis & ſine calce cohærentibus fornicis in modum conſtructo, ad tectum prebendum. Sublimi adeo loco eſt, & à vehementioribus ventis interdum ita perflato, ut lapilli inde transferantur. Paulo infra id ſacellum planities conſpicitur montibus undique cincta, in quâ multa ſunt paſcua, ubi Arietes & Capræ Cretenſes æſtate pingueſcunt. Si quis ex ſummo montis vertice undique proſpiciat parum aberit, quin totius Inſulæ ambitum videat cum aliis vicinis Inſulis, Miſo, Cerigo, ſive Cytherareliquiſque Archipelagi. Aeris intemperies in hoc monte adeo magna eſt quemadmodum ut in cæteris præcelſis montibus, ut in ipſis Caniculæ ardoribus meridie, nullo etiam ſpirante vento, ingens ſentiatur frigus: qua de cauſa nec hyeme, nec æſtate quiſquam eum incolit. Nam licet paſtores interdiu ovium greges ad paſcua agunt noctu tamen in valles ſe recipiunt.

Petri Bellonii, lib. 1. cap. 16.

In the next Chapter.

Latè porro patet hic mons ejuſque radices utrinque maris littora, ut ante diximus attingunt; nam licet urbi Candiæ ſunt vicinæ, meditullium tamen inſulæ occupat ipſe mons, adeo in ſublime evectus, ut nives ejus verticem perpetuo tegant; tamque frigida aura mediis etiam æſtatis ardoribus iſthic eſt ut vix ferri queat: tametſi in convallibus magnus ſit æſtus.

Contigit id meæ experientiæ, quod etiam aliis contigiſſe audivi, ut aſcenderem ad ſummitatem uſque montis Veneris, qui omnium in Patavino agro altiſſimus eſt, ibi per totum diem habui aerem ſereniſſimum, ſed infra circiter medium montis vidi nubes, quæ me viſio-

Jacobi Zabarelli de Regionibus Aeris, c. 8.

ne vallium prohibebant, veſperi autem poſtquam de illo monte deſcendi, inveni factam eo die infera parte magnam pluviam cum in montis cacumine nihil pluiſſet; ex eo intellexi me tranſiiſſe per mediam aeris regionem, in qua eſt facta pluvia, nec tamen eam ſenſi frigidiſſimam, imò vix aliquam animadverti differentiam frigidioris & calidioris aeris, nam æſtivum tempus erat, pro æſtivo tempore eram veſtitus, nec tamen tantum frigoris, quod me læderet, ex eo loco percepi, pars igitur illa non eſt abſolutè frigida, ſed ſolùm comparatione inferi, aeris calidioris.

Idem de Alpibus proprio exemplo edoctus teſtatum reliquit Bartholinus Syſt. Phyſ. Inſtit. Succinct. de Terra, Aere & Igne, C. 4. Reſp. 1.

Doctor *B.* anſwered me, that being at and near *Morocco*, he could ſee *Mount-Atlas* cover'd with Snow, though it was then in the Heat of Summer, and exceſſively hot where he was.

An intelligent Traveller that had viſited ſome high Mountains, and particularly the *Alpes*, and the *Pico* of *Teneriffe*, anſwered me concerning this prodigious Hill, that he found it very cold in aſcending towards the Top; and that as for the *Mount Cenes*, one of the famouſeſt of the *Alpes*, when he paſſed over it into *Italy*, though it were in *Auguſt*, and the Weather very clear, yet he felt at the Top a Wind ſo cold, that he could ſcarce poſſibly indure it, and ſeem'd to him the coldeſt that in all his various Travels he had ever felt; and yet ſome of the Mountains ſeemed much higher, being then covered with Snow.

An intelligent Gentleman that had been a Traveller into the *Eaſt-Indies*, told me, that he never ſaw nor heard of any Snow or Ice in *Guinea*, but that in ſome

Parts of *Barbary*, where in the Plains and Vallies he found the Heat ſcorch inſupportable, he could ſee the Top of the Mountains covered with Snow, in which State they continued all the Year.

A Man of Letters that lived in many Countries of the *Eaſt-Indies*, being ask'd by me divers Queſtions, partly about other things, and partly about the Temperature of the Air in ſeveral Regions, gave me among other Anſwers, this, That on the high Mountain in the Iſland of *Ceylon*, notwithſtanding the Heat of the Country, there was Snow; and the like he ſaw on the tops of the Mountains of *Congo*, though in the lower Parts of the Country they never have, that he heard of, either Ice, Snow or Hail.

About Mid-ſummer, 1688, I placed in the Cave a Glaſs, with Spirits, which ſtood above temperate, about ½ of one of the ſmall Diviſions: Another Glaſs placed without, in a common Room, ſtood at hot.

The Chriſtmaſs following, I placed the ſame Glaſſes in the ſame Places, and the Glaſs in the Cave ſtood as before, about temperate, that without ſtood at Froſt.

The Cave is cut into the bottom of a Clift that fronts to the Sea, the Earth is about 80 Foot above it, and it is cut right in about 130 Foot.

The other Day two Gentlemen belonging to the Province of *New-Hampſhire* in *New-England*, (whence they came not long ſince) and imployed by that Colony to his Majeſty here, anſwer'd me, that in the Winter the coldeſt Wind that blows in their Country, is the North-Weſt; and being ask'd again, what was their hotteſt Wind in Summer, they told me, it was likewiſe the North-Weſt. At which Anſwer being ſurprized, I ask'd them, whether they could give any Reaſon of ſo odd a Phenomenon. Whereto they anſwered, that they aſcribed it to the large Tract of the Continent, and the great Woods that lay to the North-Weſt; which Woods, they ſaid, in the Winter had their Branches, through which the Wind paſt, all laden with Snow: And in the Summer, they ſaid, the cloſe Air of the Vallies, and the thick Steams that fill'd it, would conceive ſo intenſe an Heat, that ſometimes in the Heat of Summer, when a ſudden Puff of Wind blew upon their Faces from thoſe ſultry Vales, it ſeem'd to them as if it came out of the Mouth of a Furnace, and would be ready to overcome them with the Faintneſs produced by the Heat and Vapours it brought along with it.

Balbini Hiſt. Bohem. l. 1. c. 9. De montibus, & de valle Lauezka, p. 29. Chanowsky in veſtigio Boh. piæ, C. ult. Montes parte alterâ æſtatem, altera hiemem referentes.

De montibus ad Bavariam ſtantibus mira eſt Alberti Chanowii noſtri narratio: poſt Bergreichenſteinam (oppidum fodinis hodie quæ nobile) eſſe montes non tam ſitu (alii enim ad ſeptentrionem, alii ad meridiem latus obvertunt) quam Cœlo & temporibus adverſantes, vallibus latiſſimis montes illos dirimentibus; monſtri inſtar eſt (quod ſe vidiſſe, & Anno 1639. in rem præſentem veniſſe religioſiſſimus ille & Apoſtolicus vir aſſerit) in altero monte ſæpius æſtatem, in altero appoſito hiemem dominari, ita ille ſiccus æſtivat, hic altiſſimis nivibus obſitus à viatore ſuperari non poteſt; ob eamque cauſam Meſſes ipſæ variant, & dum in montibus ad nos obverſis demeſſa ſunt omnia, altera Montium parte ſeges vireſcit: Mirius illud quod in Bieſſinenſibus & Czachrovienſibus Agris in tractu Plſnenſi, contiguis, quos unus tantum ſulcus dirimit ac dividit, deprehenditur: Czachrovienſes adhuc hibernant, cum in Bieſſinenſi Cœlum ardeat, ibi caput attollit humo frumentum, cum Czachrovii adoleſcit in culmum; elemento quoque diſpari, illud riget, hoc tepet & fervet, câque ex causâ, dum Czachrovienſes bene pelliti ingrediuntur, Bieſſinenſes

Id. ibid.

nenſes pellibus onerari ſe ſentiunt, villoſque deponunt. Aliquid tale Anno 1652. mihi quoque accidiſſe memini: nam cum Glacio Zambergam in Bohemia contenderem, & Glacio ob nives altiſſimas certum vehiculi genus, quod trahas dicimus, ſumpſiſſem, ſuperatis montibus, qui comitatum Glacenſem à Bohemia dividunt, ſubitò alia rerum facies apparuit: altero enim montium latere viridia omnia reperimus, ſic ut Trahæ nulli jam rei & uſui eſſent, & currum petere cogeremur, niſi in luto natare placuiſſet; at accolæ montium illorum quotannis id ſibi accidere confirmabant, ut unum latus montium profundiſſimæ nives contegerent, quando alterum latus lectiſſimos flores proferret, & cum ibi omnia ventis verti viderentur apud ſe è floribus ſuaviſſimos odores efflari.

I learned, by Inquiry, of an ingenious Gentleman, who ſeveral times went down into the Hungarian Gold-Mine at *Cremnitz*, that when he was drawn up out of the deep Pit, or perpendicular Groove, whoſe Depth exceeded 100 Feet; when he had aſcended above half the way, he found the Air ſenſibly warm, and ſo it continued till he came by many Foot nearer the Day, as the Workmen call the Orifice of the Pit. And when I ask'd whether this notable and ſuddain Heat did not proceed from ſome Mineral through which he paſſed in that Region of the Earth, or part of the Groove; He anſwered me, that he believed it did, in regard he was there ſurrounded with a Vein or Bed of native Vitriol, ſome of one Colour, ſome of another, which he found to be ſoft under Ground, though it ſoon after harden'd in the Air: and of theſe differingly colour'd ſorts of Vitriol he brought up thence ſeveral Pieces, ſome of which he preſented me. And when I ask'd whether the new Heat he found in that Part of the Mine, did not proceed from its being much nearer than the lower Part to the Air, which at that time was hot; and whether he found the Heat to increaſe as he came nearer the Day: He anſwered in the Negative, and told me, that after he had in his Aſcent left beneath him that warm Region, he found himſelf cold again in the ſuperiour Part of the Groove, to which the Vitriolate Region did not reach.

I remember on this occaſion, that asking an intelligent Perſon, who had more than once croſſed the Torrid Zone, what Expedient they uſed in his Ship, to keep their Beer and other Liquors, cool enough to be drinkable in thoſe ſultry Climates: He anſwered, that their way was to take the Bottle they mean to uſe, and wrap it about with a courſe Linnen Cloth dipp'd in the Sea-water, and then in ſome convenient Place of the Ship hang it in the Wind, which beating freely and unceſſantly upon it, would in no long time cool it to be potable enough. And this Gentleman, who was an obſerving Perſon, added farther, that having ſometimes for Curioſity ſake taken away a Bottle before it had been expoſed above half the uſual time, he was able to find by the Taſte, that part of the Beer or Wine, that was next the ſides of the Bottle to be refrigerated, whilſt the more inward Parts of the Liquor did yet continue hot.

The *Czar's* chief Phyſician confirmed to me, that in the Year 1664, or 63, extraordinary dry and great Scopes of Land were ſet on Fire, and miſerably waſted by the great Heat of the Sun. And he added, that the very laſt Year he found the like to have happened in *Norway*, particularly in a Place call'd by us *Bear-haven*; where having ſeen the Ruine of divers Wood-houſes burnt, and inquiring into the Cauſe, he was anſwered, that the Weather being very dry and hot, not only the

Graſs and other Vegetables were ſcorch'd up, but thoſe wooden Houſes among others, were ſet on Fire; which was confirmed to him by the Governor of the Place, and countenanced by this Circumſtance, that he ſaw the Country covered with a freſh and verdent Livery of new Graſs, brought up, inſtead of that which was burnt, by ſome Rains that fell a while before.

A Traveller and Scholar being ask'd by me, whether at *Mozambique*, which is thought the hotteſt Place in the known World, he had never obſerved the Houſes to be ſet on Fire with the mere Heat of the Sun? He anſwered me, that in the three Months he ſtayed there, he ſaw no ſuch thing, but the Inhabitants affirmed it not to be very unfrequent; and as he paſſed to and fro, ſhewed him divers Houſes that had been ſo burnt: which was the leſs ſtrange, becauſe the Houſes are not built of ordinary Stone, whereof they have none there, but fetch'd from another Place he named, where the Stone is mingled with a Subſtance, much of the Nature of a *Sulphur Vivum*. And he added, that he himſelf had divers times ſeen the Stones ſo heated in hollow Places, that Musket-Bullets being expoſed there to the direct Beams of the Sun, were in no very long time melted. He ſaid farther, that much of the exceſſive Heat of *Mozambique* proceeded from the Soil, which is exceeding bare and dry, conſiſting of white Sand; and that it is not covered with Graſs, nor ſhaded with Trees.

An obſerving Traveller that had been at *Mozambique*, being for the moſt part where 'tis not ſhaded with Trees, ſandy, he found the Sun, which was almoſt in the Zenith, to heat the Ground ſo much, that he was not able to ſtand ſtill for ſome time, but was fain to keep walking to avoid burning the Soles of his Feet.

Un Gentilhomme de mes amis plein de merit et digne de creance me mande entre pluſieures choſes extraordinaires qu' il a obſervées proche de Barege aux Pyrenées Qu'il y a des ponts de niege d' un rocher à lautre pardeſſous les quells paſſent des torrents. Il en a vu un qui embraſſe deux torrents, et qui a vint neuf toiſes de long et autant de large par deſſus. Il y a par deſſous ce pont Neuf toiſes et demi entre les Naiſſances de la voute les ponts ſont tellement forts qu' il eſtime que du Canon y paſſeroit, et il a fait rouler de groſſes pieces par deſſus.

Le tremblement de Terre que ſouffrit la Syrie l'an 750. ne fut gueres moins ſurprenant; puiſque la Terre ſ'eſtant ouverte de toutes parts, pluſieurs Villes furent abîmées, d'autres renverſées, et quelques unes qui eſtoient elevées ſur des hauteures tranſportées dans des plaines eloignées de ſix mille de leur ſituation. On en peut dire autant du froid extreme qui l'an 753. glaça le Pont-Euxin à la longueur de cent mille, et toute l'eſtendue de la mer voiſine, juſqu' à 30 condées de profondeur, quoy qu'on ne fût encore qu'au commencement de l'automne. *Journal de Scavans III.* 1685.

Asking an intelligent Perſon that liv'd a good while in *Guinea*, how they did to keep their Water cool in ſo hot a Place; he told me, that in ſome Corner of their Hutts they were wont to make Holes in the Ground, in which they buried over Night the long Earthen Jarrs, or other Veſſels, ſo as that the Orifice of the Veſſels might be lower (though not very much ſo) than the Level of the Ground. By this Means the Water would become drinkable, with ſome Coolneſs, from the Beginning of the Morning to nine or ten of the Clock; after which 'twould grow diſtaſtefully hot. He added, that when they were abroad in the Fields,

he did as well cool his Water by putting it into Callibaſhes, and hanging them all Night upon the Branches of Trees, eſpecially where they were expoſed to the Wind.

February. Since now I have ſpoken ſo much of the Cold, I hope it will not be too coldly taken, if in a few Words I make it ſome way to appear unto our Readers.

We made three Differences of the Cold, all according to the Places: In our Houſe, in the Woods, and in the open Air, upon the Ice, in our going to the Ship.

For the laſt, it would be ſometimes ſo extream, that it was not indurable; no Clothes were Proof againſt it, no Motion could reſiſt it. It would, moreover, ſo freeze the Hair on our Eye-lids, that we could not ſee; and I verily believe, that it would have ſtifled a Man in a very few Hours: We did daily find by Experience, that the Cold in the Woods would freeze our Faces, or any part of our Fleſh that was bare; but it was yet not ſo mortifying as the other. Our Houſe on the out-ſide was cover'd two third Parts with Snow; and on the inſide frozen and hung with Ice-ſickles. The Clothes on our Beds would be cover'd with hoar Froſt, which in this little Habitacle was not far from the Fire. But let us come a little nearer to it. The Cook's Tubs wherein he did water his Meat, ſtanding about a Yard from the Fire, and which he did all Day ply with melted Snow-water; yet in the Night-ſeaſon, whilſt he ſlept but one Watch, would they be firm frozen to the very bottom: And therefore was he fain to water his Meat in a braſs Kettle cloſe adjoining to the Fire; and I have many times both ſeen and felt, by putting my Hand into it, that ſide which was next the Fire, was very warm, and the other ſide an Inch frozen. I leave the reſt to our

Cook, who will almoſt ſpeak Miracles of the Cold. The Surgeon, who had hung his Bottles of Syrups, and other liquid things, as conveniently as he could, to preſerve them, had them all frozen. Our Vinegar, Oil and Sack, which we had in ſmall Casks in the Houſe, were all firm frozen. It may further in general be conceived, that in the Beginning of *June*, the Sea was not broken up; and the Ground was yet frozen; and thus much we found by Experience in the burying of our Men; in ſetting up the King's Standard towards the latter End of *June*; and by our Well, at our coming away in the Beginning of *July*; at which time, upon the Land, for ſome other Reaſons, it was very hot Weather. Capt. *James*.

Obſervations on the Top of the Pyreneans.

Monſieur *L. J.* confirmed to me what he had formerly told me, that upon the higheſt Mountain of the Pyreneans, called *Pic De Midi*, he aſcended at the End of *Auguſt*, or the Beginning of *September* (in the Morning) to the very Top, where he and his Company ſpread a Tent, and ſtaid till the Evening: He ſays, he found the Air temperate where the Sun did not beat; but on that ſide of their Bodies whereon the Sun ſhone, the Heat was exceeding great, and was offenſive, even to them that ſat in the Tent of Oil'd Cloth, if they ſat too near the Sunny ſide of the Tent: they ſometimes had Wind at the Top of the Hill, which they found to blow cool enough, (and found it very cold when they returned to the Bottom.) This Hill is ſo high, that it may be ſeen from *Montauban*, which is 27 Leagues diſtant.

When I asked whether the Air in thoſe Places, where the Sun did not beat, was conſiderably cold? He told me, that the Exerciſe they had been put to in aſcending the Top of the Hill (for the moſt part of the way they rid up) kept them from being very competent Judges of that; but they found the Wind Northerly, though weak, yet very cooling; and the North Side of the Mountain was even then cover'd with Snow, and ſcarce at all paſſable.

An ingenious Phyſician, Dr. *B.* that has been in divers of the Inland Parts of *Africa*, among other Anſwers that he return'd to the Queſtions that I ask'd him, about the Temperament of the Air in thoſe Parts, gave me this memorable one, That having had occaſion at *Morocco* to uſe ſome good dried fine Jalap that he had brought with him out of *England*, he found it by the Heat of the Air to be melted, and by Comſequence to be impulverable, in which State it continued whilſt he liv'd in that Country: but when he was returned to *Tangier*, he found it both there, and in the neighbouring Parts, pulverable again.

Nel capo di Comorino ſi termina coſi I' eſta, come I' inverno dalla parte, di la dal capo verſo Notte, & dal' altra parte correſpond ill tempo aſſai contrario è diverſo, di maniera che, chi va navigando, per quella coſta nel meſe di Ottobre, ſino ad Aprile naviga nel eſta, è non puo in tutto queſto tempo, paſſare il capo per Eſſer iui la ſtagione dell inverno, et ill Padre, che reſiede nelle Chies ch' appartengono al Capo di Comorino ne Alcune la ſtate, il che e coſa di gran Meraviglia, eſſendo cio nel medeſſimo tempo nella diſtanza ſola mente di due, o tre miglia.

P. Franceſco Barretto Relatione della Provincia di Malavar. p. 52.

An eminent Virtuoſo anſwer'd me, that in *Tirol* he had viſited a very deep Mine into which he deſcended three hundred Klaſters, which by his Computation makes about eighteen hundred of our Feet: That he paſs'd not through, that he took notice of, one hot Region by the way. That at the Bottom of the Mine he breath'd very freely, becauſe of the Air-Shafts, by which Acceſs was given laterally to the ſuperiour Air; and that being thinly clothed with one of the Digger's Habits, he found at the Bottom the Air temperate, as to Heat and Cold, though it were then Summer-ſeaſon of the Year: ſo that notwithſtanding what is ſaid of Antiperiſtaſis, no intenſe Cold was retreated thither, to ſhun the Heat of the ſuperiour Air.

An ingenious Gentleman, very converſant in our Engliſh Mines, of one of which he is Owner, anſwer'd me, that the deepeſt Mine he had particularly viſited, was a Tin Mine, whoſe Depth was ſixty ſix Fathoms, that is almoſt four hundred Foot. That deſcending into this Mine in Summer, he found it very cold at the Bottom, and the greateſt part of the way going down, without perceiving any hot Region. And when I ask'd him how ſoon he begun to find a ſenſible Cold in deſcending, he told me, that he found it within two Fathom or leſs of the Orifice of the Pit; and that in this and divers other Mines he perceived a ſenſible Cold to begin before he got down a Yard, or perhaps half a Yard beneath the upper Part of the *Faſt*, as the Mine-men call the ſolid Earth, in which they diſtinguiſh from the looſe Earth that lies above it; and is, if I may ſo call it, the Scurf of the Earth, that is far more light and porous than the other, though it be upon this looſe Earth that Plants grow, and into which even great Timber-trees themſelves ſhoot, and ſpread their Roots ſeldom or never reaching to, or penetrating into the *Faſt*, though this lie ſometimes near enough to the external Surface of the cruſty Earth.

An

An exact Relation of the Pico Teneriff, *taken from Mr.* Clappham.

ABout the 20*th* of *Auguſt*, 1646, Mr. *Clappham*, together with Mr. *Philip Ward*, *John Webber*, *John Cowling*, *Thomas Bridge*, and *George Cove*, all of them very conſiderable Merchants, and worthy of Credit, with one Guide, Servants and Horſes to carry their Wine and Proviſions, did ſet out from *Oratava*, a Port-Town in the Iſland of *Teneriff*, ſituated on the North, at two Miles Diſtance from the main Sea: They travelled from twelve at Night till eight in the Morning, by which time they got to the Top of the firſt Mountains towards the *Pico de Teraira*; here, under a very great and conſpicuous Pine-tree they brake their Faſt, dined, and refreſhed themſelves till two in the Afternoon, and then proceeded through much ſandy way, over many lofty Mountains, but naked and bare, and not covered with Pine-Trees, as their firſt Night's Paſſage were, which expoſed them to exceſſive Heat, till they arrived to the Foot of the *Pico*, where they found many huge Stones which ſeemed to have been fallen down from ſome ſuperiour Part. But before we proceed further, to give any Account of this Journey, give me leave here to interſert the Opinion of Dr. *Pugh*, a Perſon of very great Reputation, at this time in the City, who lived twenty Years himſelf on the Place, both in the Quality of a Phyſician, and a Merchant, and was very curious and inquiſitive into all that was in the Iſland: His Opinion is, that the whole Iſland of *Teneriff*, being a Ground mightily impregnated with Brimſtone, did in former times take Fire, and blow up all, or near upon all at the ſame time; and the many Mountains of huge Stones calcined and burnt, which appear every where about the Iſland, eſpecially in the South-Weſt Parts of it, were raiſed and heaved up out of the Bowels of the Earth, at the time of the general Conflagration; and the greateſt Quantity of this Sulphur lying about the Center of the Iſland, raiſed up the *Pico* to that Height, at which it is now ſeen. And he ſays, that any one upon the Place, that ſhall carefully note the Situation and Manner of theſe calcined Rocks, how they lie for three or four Miles almoſt round the bottom of the *Pico*, and in ſuch Order one above another, almoſt to the very Sugar-Loaf (as 'tis called) as if the whole Ground, and riſing up together with the Accenſion of the Brimſtone, the Torrents and Rivers of it did with a ſuddain Eruption roul and tumble them down from the reſt of the Rocks, eſpecially (as was ſaid before) to the South-Weſt; for on that ſide, from the very Top of the *Pico*, almoſt to the Sea-ſhore, lie huge Heaps of theſe burnt Rocks, one under another: and there remain to this time the very Tracts of the Rivers of Brimſtone, as they ran over all this Quarter of the Iſland, which has ſo waſted the Ground beyond recovering, that nothing can be made to grow there, but Broom. But on the North Side of the *Pico*, few or none of theſe Stones appear; and he concluded hence, that the *Vulcano* diſcharged it ſelf chiefly to South-Weſt. He adds further, that Mines of ſeveral Metals were broken and blown up at the ſame time: Theſe calcined Rocks reſembling ſome of them Iron Oar, ſome Silver, and others like Copper, particularly at a certain Place in theſe South-Weſt Parts, called the *Azuleios*, being very high Mountains, where never any Engliſh but himſelf (that he ever heard of) was. There are vaſt Quantities of a looſe blewiſh Earth, intermix'd with blew Stones, which have on them a yellow Ruſt, as that of Copper and Vitriol; and likewiſe many little Springs of vitriolate Waters; here he ſuppoſes was a Copper-Mine. And he was told by a Bell-founder of *Oratava,* that out of two Horſe-Loads of Earth, he got as much Gold as made two large Rings: And a *Portugueſe* told him, who had been in the *Weſt-Indies,* that his Opinion was, there were as good Mines of Gold and Silver there, as the beſt in the *Indies.* There are likewiſe hereabouts nitrous Waters and Stones cover'd with a deep Saffron colour'd Ruſt, and taſting of Iron. And further, he mentions one Mr. *Gilbert Lambell,* a Friend of his, who of two Lumps of Earth or Oar, brought from the Top of this Side the Mountain, made two Silver Spoons. All this he confirms from the late Inſtance of the *Palm-Iſland* eighteen Leagues from *Teneriff,* where a Vulcano was fired about twelve Years ſince, the Violence whereof made an Earthquake in this Iſland, ſo great, that he and others ran out of their Houſes, fearing they would have fallen upon their Heads: They heard the Noiſe of the Torrents of flaming Brimſtone, like Thunder, and ſaw the Fire as plain by Night, for about ſix Weeks together, as a Candle in the Room; and ſo much of the Sand and Aſhes brought from thence, by the Wind, by Clouds, fell on his Hat, as filled a Sand-box for his Ink-horn. Thus far he.

To reſume therefore the Narrative of their Journey; about ſix a Clock this Evening, they began to aſcend up the *Pico*; but being now a Mile advanced, and the way no more paſſable for their Horſes, they quitted and left them with their Servants. In this Mile's Aſcent ſome of their Company grew very faint and ſick: and from Dr. *Pugh*'s Report of eighteen in his Company, that went up about the middle of *Auguſt*, long after this, but ten got up, and theſe had all drank very plentifully below; the reſt ſo diſorder'd by Fluxes, Vomitings, and aguiſh Diſtempers, they could go no farther: Their Horſes Hair ſtood upright, like Briſtles, with the vehement Cold, who ſtood ſhaking, and refuſed to eat any thing till they came down. But calling for ſome of their Wine, which was carried in ſmall Barrels on a Horſe, they found it ſo wonderfully cold, that they could not drink it, till they had kindled a Fire to warm it, although yet the Temper of the Air was very calm and moderate; but when the Sun was ſet, it began to blow with Violence, and grew ſo cold, that taking up their Lodging under certain great Stones in the Rocks, they were conſtrained to keep great Fires before the Mouth of them all Night. About four in the Morning they began to mount again, and being come about a Mile up, Mr. *Cowling*, one of the Company, failed, and was able to proceed no further. Here begin the black Rocks. The reſt purſued their Journey till they arrived to Sugar-Loaf, where they begin to travel again in a white Sand, being fore-ſhod with Shoes, whoſe ſingle Soles are made a Finger broader than the upper Leather, to incounter this difficult and unſtable Paſſage, till they are half way up; and a Spaniel that went up afterwards with Dr. *Pugh*, (as he relates) went crying all the way, having his Skin burnt off his Feet; and then being aſcended as far as the black Rocks, which are all flat, and lie like a Pavement, they climbed within a Mile of the very Top of the *Pico*: but Mr. *Clappham*, who was the formoſt, would have perſwaded Mr. *Cove* to deſcend again, as imagining the Top of all on Fire: but at laſt overcoming that

Apprehenſion, and perſiſting, they gained the Summite, where they found no ſuch Smoak as appeared a little below, but a continual Breathing of a hot and ſulphurous Vapour, which made their Faces extreamly ſore.

In this Paſſage they found no conſiderable Alteration of Air, and very little Wind; but being at the Top, it was ſo impetuous, that they had much ado to ſtand againſt it, whilſt they drank the King's Health, and fired each of them a Piece: Here they alſo brake-faſt, but found their Strong-Waters had quite loſt its Force, and was become almoſt inſipid, whilſt their Wine was rather more ſpirituous and brisk than it was before.

The Top on which they ſtood being not above a Yard broad, is the Brink of a Pit called the *Caldera*, which they judged to be about a Musket-ſhot over, and near fourſcore Yards deep, in ſhape like a Cone, within hollow like a Caldron, and all over cover'd with ſmall looſe Stones, mixed with Sulphur and Sand, from Heat; and ſtirr'd up with any thing, puffs and makes a Noiſe, and ſo offenſive, that Dr. *Pugh* was almoſt ſtifled with the ſudden Emanation of Vapours, upon the removing of one Stone of theſe; theſe Stones are ſo hot, as they are not to be eaſily handled: They deſcended not above four or five Yards into the *Caldera*, in regard of its ſliding from their Feet, and the Difficulty; but ſome have adventured to the Bottom. Other obſervable Materials they diſcovered none, beſides a clearer ſort of Sulphur, which looks like Salt upon the Stones.

From this famous *Pico* they could ken the *Grand Canaries*, fourteen Leagues diſtant; *Palma* 18, and *Gomera* 7 Leagues; which Interval of Sea ſeemed to them no larger than the River of *Thames* about *London*: they diſcerned alſo the *Hierro*, being diſtant above twenty Leagues; and ſo to the utmoſt Limits of the Sea much farther.

So ſoon as the Sun appeared, the Shadow of the *Pico* ſeemed to cover not only the whole Iſland, and the *Grand Canaries*, but the Sea to the very Horizon, where the Top of the Sugar-Loaf, or *Pico*, viſibly appeared to turn up, and caſt its Shadow into the Air it ſelf, at which they were much ſurprized. But the Sun was not far aſcended when the Clouds began to riſe ſo faſt, as intercepted their Proſpect, both of the Sea, and the whole Iſland, excepting only the Tops of the ſubjacent Mountains, which ſeemed to pierce them through.

Whether theſe Clouds do ever ſurmount the *Pico*, they could not ſay; but to ſuch as are far beneath, they ſometimes ſeem to hang above it, or rather wrap themſelves about it, as conſtantly when the North-Weſt Winds blow: This they call the Capp, and is a certain Prognoſtick of enſuing Storms.

Mr. *John Webber*, one of this Company, who had made a Journey two Years after, arriving at the Top of the *Pico* before Day, and creeping under a great Stone to ſhroud himſelf from the cold Air, (after a little ſpace) found himſelf all wet, and admiring whence it ſhould proceed, perceived it at laſt to come from a perpetual Trickling of the Water from the imminent Rocks above him.

Many excellent and very exuberant Springs they found iſſuing from the Tops of moſt of the other Mountains, guſhing out in great Spouts, almoſt as far as the huge Pine-tree which was mentioned.

Having ſtayed ſome time upon this Top, they all deſcended by the ſandy way, till they came to the Foot of the Sugar-Loaf, which being ſteep, even to almoſt a Perpendicular, they ſoon paſſed: and here they meet a Cave of about ten Yards deep, and fifteen broad, being in Shape like an Oven or *Cupola*, having a Hole at the Top, which is near eight Yards over; by this they deſcended (an active Spaniard ſhewing them the way) by a Rope, which their Servants held at the Top, whilſt the other End being faſtened about his middle, he ſwings himſelf, till being over a Bank of Snow, he ſlides down and lights upon it. They are forced to ſwing thus in the Deſcent, becauſe in the middle of the bottom of this Cave, oppoſite to the Overture at the Top, is a round Pit of Water, reſembling a Well, the Surface whereof is about a Yard lower than the Snow, but as wide as the Mouth at the Top, and is about ſix Fathom deep, as Mr. *Lambell* reports, who plumbed it. They ſuppoſe this Water not a Spring, but diſſolved Snow, or Water blown in; for ſome Years it lies ſo full, one cannot get into the Cave for Water trickling through the Rocks.

About the Sides of the *Grotte*, for ſome Height is Ice, and Icecles hanging down to the Snow: but being quickly weary of this exceſſive cold Place, and drawn up again, they continued their Deſcent from the Mountains by the ſame Paſſages they went up the Day before; and ſo about five in the Evening arrived to *Oratava*, from whence they ſet forth: their Faces ſo red and ſore, that to reduce them and cool them, they were forced to waſh and bathe them in Whites of Eggs, *&c.*

The whole Altitude of the *Pico* in Perpendicular, is vulgarly eſteemed to be two Miles and a half.

No Trees, Herbs or Shrubs in all the Paſſage, but Pines; and amongſt the white Sands a kind of Broom, being a buſhy Plant; and at the Side where they lay all Night, a kind of Cardon, which has Stems of eight

Foot high, the Trunk near half a Foot thick, every Stem growing in four ſquares, and emerging from the Ground like Tuffets of Ruſhes; upon the Edges of theſe Stems grow very ſmall red Buttons or Berries, which being ſqueezed, produce a poiſonous Milk, which lighting upon any part of a Horſe, or other Beaſt, fetches off the Hair from the Skin immediately: Of the dead Part of this they made their Fires all Night. This Plant is alſo univerſal over the Iſland, and is happly, and as I conjecture, a kind of *Euphorbium*.

In ſome part of this Iſland alſo there grows a crooked Shrub, which they call *Legnan-vell*, which they bring for *England* as a ſweet Wood. There are likewiſe Apricoks, Peaches, and in Standards, which bear twice a Year: Pear-Trees alſo which are as pregnant; Almonds of a tender Shell, Palms, Plantanes, Oranges and Lemons, eſpecially the Pregnadas, which have ſmall ones in their Bellies, from whence they are ſo denominated. Alſo they have Sugar-Canes, and a little Cotton and Colloquintida; the Roſes blow at *Chriſtmas*; there are good Carnations, and very large, but Tulips will not grow or thrive there: Sampier clothes the Rock in abundance, and a kind of Clover the Ground. Another Graſs growing near the Sea, which is of a broader Leaf, ſo luſcious, as it will kill a Horſe that eats of it, but no other Cattel. There is alſo an Herb which they make Thread of. Eighty Ears of Wheat have been found to ſpring from one Root, but it grows not very high; the Corn of this is tranſparent and bright, like unto the pureſt yellow Amber; and one Buſhel has produced 130 in a ſeaſonable Year.

The Canary-Birds (which they bring to us in *England*) breed in the *Barrancos* of *Gills*, which the Water has fretted away in the Mountains, being Places very cold. There are alſo Quails, Partridges larger than ours, and exceeding beautiful; great Wood-Pigeons, Turtles at Spring, Crows; and ſometimes from the Coaſts of *Barbary* appears the Faulcon. Bees are carried into the Mountains, where they proſper wonderfully.

They have wild Goats on the Mountains, which climb to the very Top of the *Pico* ſometimes. Alſo Hogs, and Multitudes of Conies: Camels are brought from *Lancerote*, beſides other Cattel.

Fiſh. The Cherna, a very large and excellent Fiſh, better taſted than any we have in *England*. The Mero, Dolphin, Shark, Lobſters without the great Claws, Muſſels, Periwinkles, and the Clacas, which is abſolutely the very beſt Shell-fiſh in the World; they grow on the Rocks, five or ſix under one great Shell, through the Top whereof they peep with their Nebbs, from whence (the Shells being broken a little more open with a Stone) they draw them forth. There is likewiſe another Fiſh like an Eel, which has ſix or ſeven Tails of a Span in length, united to one Head and Body, which is alſo as ſhort. Beſides theſe they have Turtles and Cabridos, which are preferable before our Trouts.

The Iſland is full of Springs of pure Water, taſting like Milk; and in *La Laguna* (where the Water is not altogether ſo limpid and clear) they percolate it through a kind of ſpungy Stone cut in form of a Baſon.

The Vines which afford thoſe excellent Wines, grow all about the Iſland, within a Mile of the Sea; ſuch as are planted farther up, are nothing eſteemed, neither will they thrive in any other Iſlands.

For the *Guanchios*, or the ancient Inhabitants, Dr. *Pugh* gives this full Account.

September the 3*d.* about twelve Years ſince, he took his Journey from *Guimar*, a Town inhabited for the moſt part by ſuch as derive themſelves from the old *Guanchios*, in the Company of ſome of them, to view their Caves, and the Bodies buried in them. This was a Favour they ſeldom permit to any, (having in great Veneration the Bodies of their Anceſtors, and likewiſe being moſt extreamly againſt any Moleſtation of the Dead) but he had done many ſeveral Eleemoſinary Cures amongſt them, (for they are generally very poor, yet the pooreſt thinks himſelf too good to marry with the beſt Spaniard) which endeared him to them exceedingly; otherwiſe it is Death for any Stranger to viſit thoſe Caves or Bodies.

Theſe Bodies are ſewed up in Goat-skins, with Thongs of the ſame, with very great Curioſity, particularly in the incomparable Exactneſs and Evenneſs of the Seams; and the Skins are made very cloſe and fit to the Bodies: moſt of theſe Bodies are entire, the Eyes cloſed, Hair on the Head, Ears, Noſe, Teeth, Lips, Beard, all perfect, only diſcoloured, and a little ſhrivled: likewiſe the *Pudenda* of both Sexes. He ſaw about three or four hundred in ſeveral Caves, ſome of them are ſtanding, others lie on Beds of Wood, ſo hardned by an Art they had, (which the Spaniards call *Curar*, to cure a Piece of Wood) which no Iron can pierce or hurt. He ſaid, that one Day being a Hunting, a Ferret (which is in uſe there) having a Bell about his Neck, ran after a Coney into a Hole, where they loſt the Sound of the Bell; the Owner being afraid he ſhould loſe his Ferret, ſeeking about the Rock and Shrubs, found the Mouth of a Cave, and entring in, was ſo affrighted, that he cried out: it was at the Sight of one of theſe Bodies, very tall and large, lying with his Head upon a great Stone, his Feet ſupported by a little Wall of Stone, the Body reſting on a Bed of Wood, as before was mentioned.

The Fellow being now a little out of his Fright, enter'd in, and cut off a great Piece of the Skin that lay on the Breaſt of this Body, which the Doctor ſays was more flexible and pliable than ever he felt any Kids Leather Glove, and yet ſo far from being rotten, that the Man made Uſe of it for his Flail many Years after.

Theſe Bodies are very light, as if made up of Straw: and in ſome broken Limbs he obſerved the Nerves and Tendons, and alſo ſome Strings of the Veins and Arteries very diſtinctly.

His great Care was to enquire of theſe People, what they had amongſt them of Tradition, concerning the embalming and Preſervation of theſe Bodies? From ſome of the oldeſt of them (above a hundred and ten Years of Age) he received this Account: That they had of old one particular Tribe of Men that had this Art amongſt themſelves only, and kept it as a thing ſacred, and not to be communicated to the Vulgar; theſe mix'd not with the reſt of the Inhabitants, nor married out of their own Tribe; and were alſo their Prieſts and Miniſters of Religion: that upon the Conqueſt of the Spaniard, they were moſt of them deſtroyed, and the Art loſt with them, only they held ſome Traditions yet of a few Ingredients that were made uſe of in this Buſineſs.

They took Butter of Goats Milk, (ſome ſaid Hogs Greaſe was mingled with it) which they kept in the Skins for this Purpoſe; in this they boiled certain Herbs; 1*ſt.* A ſort of wild Lavender, which grows there in great Quantities on the Rocks. 2*dly.* An Herb called *Jara*, of a very gummy and glutinous Conſiſtence, which now grows under the Tops of the Mountains only. *3dly.* A kind of a Cyclamen or Sow-Bread. *4thly.* Wild Sage growing plentifully in this Iſland. Theſe, with Stones bruiſed and boiled in the Butter, render'd it a perfect Balſam. This prepared, they firſt unbowelled the Corps; and in the poorer ſort, to ſave Charges, they took out the Brain behind: and theſe Poor alſo were ſewed up in Skins with the Hair on, whereas the Richer were (as was ſaid before) put up in Skins ſo finely and exactly dreſſed, as they remain moſt rarely pliant and gentle to this Day. After the Body was thus order'd, they had in a Readineſs a Lixivium, made of the Bark of Pine-Trees, with which they waſhed the Body, drying in the Sun in Summer, and in Stoves in Winter; this repeating very often. Afterwards they began their Unction with the Balſam, both without and within, drying it again, as before: This they continue till the Balſam had penetrated it ſelf in the whole Habit, and the Muſcles in all Parts appeared through the contracted Skin, and the Body became exceeding light; then they ſewed them up in the Goat-skins, as already mentioned. He was told by theſe ancient People, that they have above twenty Caves of their Kings and Great Perſons, with their whole Families, yet unknown to any but themſelves, and which they will never diſcover. Laſtly, he ſays, that Bodies are found in the Caves of the *Grand Canaries*, in Sacks, and quite conſumed, not as thoſe in *Teneriff*. Thus far of the Bodies and Embalming. Anciently when they had no knowledg of Iron, they made their Lances of Wood, harden'd as before, ſome of which the Doctor has ſeen: he has alſo ſeen Earthen Pots ſo hard, that they cannot be broken, of theſe ſome are found in the Caves, and old *Barrancos*, and uſed by the poorer ſort of People that find them, to boil Meat in; likewiſe they did *Curar* Stone it ſelf, that is to ſay, a kind of Slate now called *Tabona*, which they firſt formed to an Edg or Point, as they had occaſion to uſe them, either as Knives, or Lancets to let Blood.

Their Food was Barly roſted, and then ground with little Mills, which they made of Stones, and mix'd with Milk and Honey; this they ſtill fed on, and carried it on their Backs in Goat Skins.

To this Day they drink no Wine, nor care for Fleſh; they are generally very lean, tall, active, and full of Courage.

He himſelf has ſeen them leap from Rock to Rock, from a very prodigious Height, till they came to the bottom, ſometimes making ten Fathom deep at one Leap. The manner is thus.

Firſt, they tertiate their Lance, (which is about the Bigneſs of a half-Pike) that is, they poiſe it in their Hand, then they aim the Point of it at any Piece of a Rock, upon which they intend to light, ſometimes not half a Foot broad; at their going off they clap their Feet cloſe to the Lance, and ſo carry their Bodies in the Air; the Point of the Lance firſt comes to the Place, which breaks the Force of their Fall; then they ſlide gently down by the Staff, and pitch their Feet upon the very Place they firſt deſigned, and from Rock to Rock, till they come to the bottom.

Their Novices ſometimes break their Necks in Learning. He added ſeveral Stories to this Effect, of their great Activity in leaping down Rocks and Clifts, and how eight and twenty of them made an Eſcape from the Battlement of an extraordinary high Caſtle in the Iſland, when the Governour thought he had made ſure of them.

He told alſo (and the ſame was ſeriouſly confirmed by a Spaniard, and another *Canary*-Merchant then in the Company) that they whiſtle ſo loud, as to be heard five Miles off; and that to be in the ſame Room with them when they whiſtle, were enough to endanger breaking the Tympanum of the Ear: And added, that he being in the Company of one that whiſtled his loudeſt, could not hear perfectly for fifteen Days after, the Noiſe was ſo great.

He affirms alſo, that they throw Stones with a Force almoſt as great as that of a Bullet, and now uſe Stones in all their Fights, as they did anciently.

Mr. *Sydenham* told me this Day, that upon the 18*th* of *Auguſt*, he and his Company began their Journey toward the Pike of *Teneriff*, ſetting out from *L' Oratava*, a Town ſeated on the lower Part of the Mountain, from which Town to the Sea there are three Miles of way always deſcending.

He began his Journey on Sunday about 10 a Clock at Night, and travell'd till five in the Afternoon of the Monday following, reſting two Hours by the way; the Ground was continually riſing, and during this time they travelled about 10 Miles of their way upon Mules.

Reſting upon Monday till 12 a Clock at Night, they reſumed their Journey, and travelled till about 9 in the Morning, at which time they arrived at the Top of the Sugar-Loaf, or higheſt Pile of the Mountain.

They went up on the South Side of the Hill, on which Side there was no Snow, though on the North Side there were much. They ſtayed about two Hours on the Top of the Sugar-Loaf, and then returned to that Part of the Hill where they had lodg'd the Night before.

I ask'd Mr. *Sydenham* what was the Eſtimate made by the moſt knowing Perſons of the Iſland, of the Height of the Hill? and he told me, that the Guides accounted it to be one and twenty Miles high from the Town, which, as was noted before, is ſeated three Miles above the Sea. And he added, that a Sea-man with great Confidence affirming himſelf to have accurately enough meaſur'd by Obſervations made in a Ship, and to have found the Perpendicular Height of the Hill to be about ſeven Miles.

I asked him alſo from what Diſtance the Top of the Sugar-Loaf could be ſeen at Sea, according to the common Opinion of Sea-men? He anſwer'd, that the Diſtance was wont to be reckoned threeſcore Sea-Leagues, of three Miles to a League; adding, that he himſelf had ſeen it above forty Leagues off, and yet it appeared exceeding high, and like a blewiſh Pyramide, manifeſtly a great deal higher than the Clouds. And he alſo told me, that ſometimes Men could from thence ſee the Iſland of *Madera*, though diſtant from it 70 Leagues; and that the great *Canary*, though 18 Leagues off, ſeem'd to be very near them, as if they might leap down upon it.

He told me, that the higher Part of the Region of Snow was two Miles, or two Miles and a half lower than the Foot of the Sugar-Loaf; and that on the upper part of the Hill they felt no Wind.

Mr. *Sydenham* told me, that being at the Top of the Sugar-Loaf, drinking the King's Health, he indeavoured to ſhoot off a Birding-Piece he had carried up with him, but though he ſnap'd it above twenty times, he could not make it go off; whereas when he came down into the ordinary Air, the firſt time he tried to ſhoot, it went readily off. I ask'd him whether he had taken notice that the Flint ſtruck out any Sparks of Fire or no at the Top of the Hill, and whether he had mended and alter'd the Flint coming downwards? To the firſt he anſwered he did not remember, to the other that he remembred he did not.

He alſo told me, that having carried up a Borracha of Sack, when they came to the Top of the Mountain, they drank divers Healths very freely, but could not find themſelves heated, or ſenſibly diſcompoſed by the Wine; whereas when they were come down into a thicker Air, they manifeſtly felt the heady Operation of the Liquor, which then made their Guide and one of their Company drunk.

He deſcribed the Sugar-Loaf to be in the midſt of a barren Plain, in the upper Part of the Mountain, and to be exceeding ſteep. The Top of the Sugar-Loaf is made ſhelving inward almoſt like a Diſh. But in many Places of it there appear little Holes (regularly placed) as it were ſo many little Vents to a great Fire burning in or below the Bowels of the Mountain. He told me, that the Guide diſſwaded him from going to the middle of this ſhelving Top, affirming it to be exceeding dangerous: but he ventur'd to thruſt the ſcowring Stick of his Gun ſomewhat deep and rudely into one of thoſe Holes, from whence there aroſe a hot Steam, which had like to have killed him, and hindred him from further Trials. He added, that the Top of the Mountain ſeem'd to be little elſe than Stones and Sulphur, and that there were great Store of Pieces of Brimſtone, which are gueſſed to be ſublimed up from the internal Parts of the Hill.

Being asked, whether he was ſick or no in the Aſcent? he ſaid, that both he and all his Company, which were about a dozen Men, were ſick for three or four Hours, when they came into the ſubtile and piercing Air of the upper Part of the Mountain: but as they went down again, they were not ſick. And being asked what kind of Sickneſs it was they felt? he ſaid it was like Sea-ſickneſs.

He told me, that the Sack they carried up with them to refreſh themſelves, ſeem'd to them at the Top of the Mountain ſo very cold, that they were not able to drink above two or three Drops at a Draught, by reaſon of the Operation of the exceſſive Cold upon their Teeth. He added upon my Inquiry, that his Feet were not more than ordinarily warm, and yet one of the two Pair of Pumps he carried up with him were burnt off his Feet by the Brimſtone.

When I asked him about the Difference of Seaſons at the ſame time in the ſame Mountain, he told me, that he paſſed over one of them by Name.

On the one Side of which it was exceſſively hot near the Top or Ridg, as well, though not quite ſo much, as in the lower Regions on the Side of the Mountain; but within a Mile or two on the other Side of the Ridg he found Winter-Weather, as to Cold and Storminеſs, and yet there was Snow as well on the other Side as on this.

To what Depth the Water will be frozen in hard Winters.

To what Depth the Earth will be frozen in that Seaſon.

Whether Muſcovian Ice be conſiderably, or at leaſt ſenſibly harder than Engliſh Ice.

Whether by caſting up Water, or by ſpitting, the Liquor will freeze before it comes to touch the Ground.

Whether Brandy, Sack, *&c.* will freeze in *Ruſſia.*

Whether Inſtruments of Iron and Steel be much more brittle there than here.

Of the cracking of the Timber in wooden Houſes, and the Cauſes of it.

Of the Preſervation of Fleſh, Fiſh, Herbs, Eggs, *&c.* in hard Weather.

Of the curing of thoſe whoſe Noſe, Cheeks, *&c.* are frozen.

Of the Symptoms of thoſe that are frozen to Death.

Of the keeping of dead Bodies.

TITLE XX.

Of the Air in reference to Light ; *its Perſpicuity, Opacity, Reflections, Refractions, Colours, Light, and Lightning.*

A Very learned Traveller affirmed to me, that having occaſion to reſide ſometimes on the *Riviera* or Coaſt of *Genoua*, he had often obſerved, that from a high Place he could both Morning and Evening clearly diſcern the Iſland of *Corſica* ; and ſometimes alſo other Places in that Sea, though he could not ſee them at Noon, how fair and clear ſo ever the Weather was, when the Sun was in or near the Meridian.

His late Majeſty K. *Charles* the Second, doing me one Day the Honour to diſcourſe about ſeveral Marine Obſervations, was pleaſed among other things to acquaint me with this rare Phænomenon. He was one Day walking upon the Beach on the Strand, not far from *Dover*, to injoy the freſh Air, and the Proſpect of the Sea, when caſually looking forwards to the Verge of the viſible Horizon, he was very much ſurprized to diſcover there a new Coaſt, with riſing and falling Grounds, newly, as it were, emerged out of the Ocean, in a Place where no ſuch thing had been ſeen before. The Strangeneſs of this unlook'd-for Apparition made Him ſuſpect ſomething of Illuſion offer'd to his Eyes by the Beams of the Sun that ſhone upon the Neighbouring Objects ; wherefore he rubb'd his Eyes, and the new Scene not vaniſhing, he call'd to his Royal Highneſs the Duke of *York*, (who was preſent when his Majeſty was pleaſed to make me the Relation) and to ſome of the attending Courtiers that were neareſt at hand, to make them Partakers and Witneſſes of this delightful Spectacle, which after it had been gazed on a little while, did ſomewhat ſlowly diſappear, as if it had ſunk down again into the Ocean. Of the Cauſe of this rare Phænomenon, I ventur'd to propoſe to the King this Conjecture: That the Place where it was ſeen lying the ſame way that the Coaſt of *France* did, and that Coaſt being but a little too far off to be diſcern'd before, it might very well happen, that either by Action of the Sun, or rather by ſubterraneal Steams, the Air interpoſed between the Shore and his Majeſties Eyes, was fill'd with Vapors and Exhalations that made it much more refractive than formerly; and by Help of this ſupervening Refraction, the French Coaſt that lay beyond it was raiſed, and as it were lifted up, in reference to the Sight, and ſo became viſible as long as that new Refraction laſted: And when the Steams that occaſion'd it, were either got up too high, or were by the Winds or Sun too much diſſipated or diſperſed, the Apparition ceaſed, together with the unuſual Refraction that cauſed it. And in favour of this Conjecture I alledg'd that familiar Experiment in which a Piece of Gold, or the like convenient Object, being put into the bottom of an empty Cup, and the Eye being ſo placed, that the Object is but juſt hid from it by the Interpoſition of the Side of the Cup, if Water be poured into the Veſſel, though neither the Eye nor the Object be at all removed, yet the Piece of Gold will be plainly ſeen, becauſe the Surface of the Water, which is a thicker Medium than the Air, breaking the Rays that tend from the

Object towards the Beholder's Eye, according to the Laws of Refraction, that is from the Perpendicular they are ſo bended, that thoſe fall now into the Pupil, that if it were not for the Water, would either fall upon the Side of the Cup, and ſo be hinder'd from paſſing forward; or elſe would fall upon the Eye-lids or Eye-brows, or ſome other Part above the Pupil, and ſo would not make the Object viſible.

The Duke of *York* was alſo pleaſed to tell me, that he was ſomewhat ſurprized, when being near the Borders of *Scotland*, in a Seaſon that did not promiſe much fair Weather, he ſaw one Morning the Sky very red, and thereupon ſaid, that he fear'd they ſhould have foul Weather, according to the uſual Prognoſtick of Country-men and Mariners: but ſome of the Scotiſh Nobility that attended his Highneſs, told him, that in that Country ſuch red Mornings did not bode a foul Day, but rather promiſe a fair one; which Prediction of theirs was juſtified by the Event. Upon which occaſion I enquired of a very intelligent Scotiſh Noble-man, how far the Obſervation held in his Country? To which he anſwer'd, that with a due Limitation it was moſt commonly true; for though when the Redneſs ſeems to be very near the Ground, and appears in ſomewhat narrow Streaks of an intenſe Red, it ſignifies bad Weather; yet if the Morning Redneſs appears elevated in the Air or Sky, eſpecially if the Wind be Eaſterly, it uſually foretels a fair Day.

Some Obſervations of Capt. James, *in his Northern Voyage, Mr.* J. T. *and others.*

February. I practiſed ſome Obſervations by the riſing and ſetting of the Sun, calculating the time of his riſing and ſetting, by very true running Glaſſes. As for our Clock and Watch, notwithſtanding we ſtill kept them by the Fire-ſide in a Cheſt, wrap'd in Clothes, yet were they ſo frozen, that they could not go. My Obſervations by theſe Glaſſes, I compared with the Stars coming to the Meridian: By this means we found the Sun to riſe twenty Minutes before it ſhould; and in the Evening to remain above the Horizon twenty Minutes (or thereabouts) longer than it ſhould do: And all this by reaſon of the Refraction. Capt. *James.*

March. This Evening the Moon roſe in a very long Oval alongſt the Horizon.

April. The Weather continued with this Extremity until the fifteenth, at which time our Spring was harder frozen than it had been all the Year before. I had often obſerved the Difference betwixt clear Weather and miſty refractious Weather, in this manner: From a little Hill which was near adjoining to our Houſe, in the cleareſt Weather, when the Sun ſhone with all the Purity of Air that I could conceive, we could not ſee a little Iſland, which bare off us South-South-Eaſt ſome four Leagues; but if the Weather were miſty, (as aforeſaid) then we ſhould often ſee it from the loweſt Place. This little Iſland I had ſeen the laſt Year when I was on *Danby*-Iſland. The 13*th* I took the Height of it inſtrumentally, ſtanding near the Sea-ſide, which I found to be 34 Minutes, the Sun being 28 Degrees high. This ſhows how great a Refraction here is. Yet may this be noted by the way, that I have ſeen the Land elevated by reaſon of the refractious Air; and nevertheleſs the Sun hath riſen perfect round.

January 6. I obſerved the Latitude with what Exactneſs I could, (it being very clear Sun-ſhine Weather) which I found to be 51, 52. This Difference is by reaſon that here is a great Refraction.

January 21. I obſerved the Sun to riſe like an Oval alongſt the Horizon; I called three or four to ſee it, the better to confirm my Judgment, and we all are agreed, that it was twice as long as it was broad. We plainly perceived withal, that by Degrees as it got up higher, it alſo recovered Roundneſs.

Attending upon Sir *Peter Wych*, in his Journey for *Warſaw* the Beginning of *June*, 16$\frac{69}{70}$, whilſt we lay about three Poliſh Miles from the City, attending the Preparations for his Reception there, we had very clear and extream cold Weather; and for two Days together we obſerved the Sun and two Parhelions, or three Suns, from above ten a Clock to near twelve, not the leaſt Cloud appearing in the Air, but that ſo ſerene, that we took notice of the Icy Spangles in the Air, flying about like Atoms in the Sun's Beams. This is alſo worth taking notice of; that whereas in ordinary froſty Weather any ſmooth Iron, or other Metal, whether Heads of Sticks, Pomels of Swords, or Barrels of Guns, being brought out of the open Air into a warm Room, there will preſently, firſt a Dulneſs in the Glaſs, and then Drops of Water appear: At this time there would immediately appear the Likeneſs of an hoar Froſt. Now whether the Particles of Cold be ſo ſubtile as to pierce or enter into poliſhed Metal, I will not determine; tho the Experience of wetting one Finger with his Spittle, and forthwith laying it to Iron when it freezes hard, by its immediate Adheſion, even in the Moment of touching it, would make ſome way for the Affirmative. That ſame Month returning back from *Warſaw*, I ſaw, upon my Journey, the Sun riſe with a large Pillar, coloured like a Rain-bow, perpendicular over it, out of a clear Horizon; and I remember Monſieur *Hevelius* told me, he obſerved it once ſet with the like, N.

In *Cornwall* they obſerve in their driving home Levels or Sink, the Waters do alſo manifeſtly partake of the Minerals, for in ſome Mines they are Sanative, where Iron is obſerved; and in others apt to cauſe Wounds to feſter and rankle. As the firſt was moſt manifeſt at *Karne Key*, the latter at *Reliſtian*; both famous Tin-Works.

Asking of a Chymiſt that travelled with a famous Virtuoſo of my Acquaintance over part of the *Alpes* that is ſaid to be much ſubject to Thunders, divers Queſtions about Thunder, I had among other Anſwers, this, That he and my Friend being together at the Top of a forked Mountain, between whoſe Parts there lay a Valley, that ſeem'd almoſt cover'd with a thick Cloud; and though the Weather were clear at both the Tops, he obſerved that the ſubjacent Cloud being big with Thunder, the Lightning appeared quite through it, and ſeem'd to lie deep in it, ſo that caſting his Eyes down upon the Cloud, he fancied that what he ſaw, was, (to uſe his own Compariſon) as if a ſhining Fiſh were moving to and fro very ſwiftly in a ſomewhat troubled Water. If I had ſeaſonably had the Relation, I had enquired of my Friend about it; but I was the more inclined to believe it, becauſe I remember, that paſſing over a part of the *Alpes*, leſs high than that where the recited Obſervation was made, though it was very fair Weather, and a clear Sky at the Top of the Mountain where we were, yet a great way beneath us we ſaw dark Clouds, through part of which we afterwards in our Deſcent were obliged to paſs, though then (whether part of the Matter had been in the mean while diſcuſſed, I examine not) it ſeemed to us little different from a thick Fog, which when we had paſſed thorow, we found the Weather fair and clear enough to the Foot of the Mountain.

Meeting with an inquiſitive Noble-man that liv'd long at *Naples*, I asked him whether he had ever ſeen any of thoſe famous Apparitions that are ſaid ſometimes to ſhew themſelves in or near the *Sicilian Strait*, and is known by the Name (if I miſtake not) of *Morgane*? To this he anſwered me, that during the Spring-time, he had once the Curioſity to try whether this Tradition had ſo much Ground as was commonly believed; and that accordingly on ſeveral fair Mornings he roſe before the Sun, and look'd ſolicitouſly along the Coaſt, without ſeeing any thing that anſwered his Expectation: But not being diſcouraged by theſe Diſappointments, he one Morning perceived, as he thought, two Steeples in a Neighbouring Town where he knew there was but one; which Phænomenon inviting him to continue his Curioſity, he choſe the firſt fair and cloudleſs Morning to riſe early on; and caſting his Eyes towards the lately mentioned Town, and the Coaſt it was not remote from, he was ſurprized with a delightful Proſpect of a new Town beyond the other, and incomparably greater than it, and furniſh'd, as it ſeem'd to him and a Doctor of Phyſick that accompanied him, with Walls and Towers, and Steeples and Houſes, and other things that were delightful, as well as wonderful to behold. But he anſwer'd me, that the Colours were not near ſo lively as the Figures, being for the moſt part ſomewhat dim, though adorned here and there with ſome Redneſs: but this odd Spectacle, as it was not invariable during the whole time it laſted, did not continue very long; for when the Sun was gotten up to ſuch a Height above the Horizon as made his Beams powerful, they quickly confounded all theſe Airy Structures in a kind of Chaos, and made the fantaſtick City vaniſh.

Moiſt Vapours are not the only Cauſe or Sign of the Opacity of the Air, ſince that dry blighting Eaſt Wind, which from the Effects Country People call a red Wind, makes the Air at a Diſtance ſeem blewiſh and thick. This is the Wind which theſe two Years laſt paſt, has been ſo pernicious to Apples, and indeed to all ſorts of Trees, not only to blaſt the Fruit, but the very Leaves of ſuch Trees as it met withal, juſt in the *Tender* (as the Woodmen call it) *i. e.* when they are newly expanded out of the Buds. Mr. *J. T.*

That Air is ſometimes more clear and tranſparent, and ſometimes more dark, and, as it were, muddy, being clogg'd and opacated with terreſtrial Steams, is every Man's Obſervation. But there are ſome Phænomena that depend upon the Denſity, Diaphancity, *&c.* of the Air, that are not ſo vulgarly taken notice of: For beſides thoſe that require Skill in the Doctrine of Refractions, on which therefore I ſhall not now inſiſt; there are ſome others that may be worth your notice, which I ſhall give a Taſte of.

Conſidering the differing Accounts that are given by good Authors, of the number of the Fixed Stars, and comparing them with ſome Obſervations of our own, I was thereby, and upon ſome other Grounds, induced to ſuſpect that the differing and unheeded Conſtitutions of the Air might occaſion a Difference in aſſigning the Number of the Stars: which made me inquire of ſeveral Navigators and Travellers, ſome into the torrid Zone, and others into the frigid ones, what Difference they found in contemplating the Stars in thoſe Climates, and in ours; and by this Inquiry, I learned that in ſome Places where the Air is very pure, Celeſtial Obſervations may be more happily made. And particularly becauſe I ſuppoſed that intenſe Cold, by precipitating the darkning Vapours out of the Air, may probably make it more defecate and clear. I deſired an ingenious Phyſician that travelled in *Muſcovy*, to take notice of any thing that ſhould favour or disfavour this Conjecture. In Compliance with which Requeſt of mine he informed me, that travelling one Night in a Sled in the more mediterranean Parts of *Ruſſia*, the Weather being extraordinary cold, he was invited to quit his Sled a little to conſider the Sky, where he ſaw ſo many Stars, and ſo much brighter than he had ever ſeen before, that he was almoſt as much ſurprized as delighted with ſo glorious a Spectacle, which he ſhewed to ſome of his Fellow-Travellers that ſhared in his Wonder.

And this brought into my Mind, that remembring that the ingenious Capt. *James* being forc'd to winter in *Charlton*-Iſland, which though but of the Latitude almoſt of *Cambridg*, is but little, if at all, leſs cold than *Nova Zembla* it ſelf, I ſhould probably find ſomething pertinent to our preſent Subject in ſo diligent an Obſerver. I reſorted to his Voyage, where I met with theſe notable Obſervations.

January 30 and 31, there appeared in the Beginning of the Night more Stars in the Firmament than ever I had ſeen before, by two thirds. I could ſee the Cloud in *Cancer* full of ſmall Stars: and amongſt the *Pleiades* a great many ſmall Stars. About ten a Clock the Moon did riſe, and then a quarter of them was not to be ſeen. The Wind for the moſt part of this Month hath been Northerly, and very cold, *&c.* Capt. *James*, p. 62.

The Ruſſian Emperor's Phyſician confirmed to me by word of Mouth, what he had ſome Years ſince told me in a Letter, that one Night which was exceeding cold and clear, being awakened out of his Sleep by a Shake that had like to have overturn'd his Sled, he look'd out and ſaw more Stars by far than ever he ſaw in *England*, or the Neighbouring Parts of *Europe*, and particularly that he ſaw many about the 7 Stars, or the *Pleiades*, and divers others he had not ſeen before in ſeveral other Parts of the Sky. He farther told me, that theſe Stars ſeemed far more beautiful and bright than was uſual, inſomuch that he doubts not, that if it had not been for the Snow, ſome of them would have caſt a diſcernable Shadow. For Confirmation, he ſaith, that the Phænomena were not only taken notice of by him, but by others that travelled with him; and that though he often gazed at the Sky, ſince that time he never could ſee there near ſo many Stars, nor ſo bright.

December 4. I had not time the laſt Week to tell you of ſomething, that to us that have not been long in this Country ſeems ſtrange, but the People of this Place ſay happens very often.

On the 29*th* of the laſt Month, after I had written and ſent away my Letters, looking out of the Dutcheſſes Window to ſee what Weather it was, I ſaw towards the N E. alongſt the Horizon, it look'd as light, and juſt as if it had been Break-of-Day, (it was then about a quarter paſt eleven) and gave as great a Light; I went then into the Drawing-Room, and looking out of that Window, could look more Northerly, and ſaw it was more light due N. and ſaw ſeveral Streaks of Light, like the Tail of the Blazing Star, all pointing N. and S. one of which was as long or longer than that we ſaw laſt Year, for it reached from the Horizon, and paſs'd betwen *Charles*'s *Wain* and the N. Star, and reached up juſt over our Heads. The ſmall ones ſometimes diſappeared : and then we ſaw others of the ſame Dimenſions appear in other Places, they were all near the great one; two of them ſeem'd as if their Light had come from the two Guards in *Charles*'s *Wain*; and when they vaniſhed, others appeared more South. I went to the other Side of the Houſe, and ſaw that the Light reached from the W. or W N W. by the N. to the E. or E N E. I did not go out, becauſe it blew very hard, and was very wet, contenting my ſelf to ſee it out of the Houſe, but ſent *Geo. Man* up the Hill, who ſaw the ſame, and it was ſo clear they could ſee the *Frith.*

About the New Moon before, there was ſuch a Light as this ſeen by Lord *Belcarus*, as he came in the Night from St. *Andrews* to his Houſe, and by the Seamen of the Yacht at *Leith*, and by ſome here in Town: But though the Sky was not then ſo clear, there being broken Clouds, yet it gave ſuch Light, as they could read very plainly, as they told me; that began about 7, and laſted till 9. This laſt I did not ſee till after 11, and at a quarter of 12 it began to leſſen, at which time I went to Bed, and the Tails were then no more to be ſeen. Tell Dr. *Flamſted* of this, and know of him, whether he has ſeen or heard of ſuch kind of things.

This was from his Royal Highneſs the Duke of *York*, then High Commiſſioner in *Scotland*.

An intelligent Gentleman that liv'd in *Africk*, being asked by me, how far off he was able to ſee the Top of the *Pico* of *Teneriff* at Sea? replied, that by the Eſtimate of the Captain of the Ship, it was near 50 Leagues, and yet it appear'd to him ſo high above ſome Clouds, and ſo near, that he was fain to caſt his Head up to ſee it.

TITLE XXI.

Of the Operation of the Air on the Conſiſtency *of Animal Subſtances.*

AS on the one ſide the Schools teach the Air to be a ſimple and elementary Body, that is, only hot and moiſt; ſo on the other Side, the Generality of Men are ſo accuſtomed to judg of things by their Senſes, that not finding the Air to be a viſible Body, they aſcribe leſs to it than even the School-men do; and what is inviſible, they think to be next Degree to nothing. And indeed both the one ſort of Men and the other, are wont to conſider the Air only as a Receptacle, that barely harbours the viſible and palpable Bodies committed to it, or as it were depoſited in it, without acting upon them, unleſs it be perhaps a little upon the Account of its manifeſt Qualities, Heat and Moiſture. But for my part, who look upon the Air under another Notion, and think it may as well alter as receive the Bodies that lie expoſed to it; I am apt to allow it in reference to ſome Bodies, certain other Faculties and Powers, among which ſome may be called Generative and Maturative, and others Corruptive; and this not only in reſpect of Animals and other Bodies of a ſlighter Texture, but even of Salts and Minerals themſelves.

An obſerving Man that had ſailed to and fro between *Europe* and the *Eaſt-Indies*, anſwered me, among other things, about their way of tranſporting Cheeſe; That the Cheeſe they uſed to take along were *Cheſhire*, of a very conſiderable Thickneſs, which they incloſed in leaden Boxes fit for them, and thereby were able to preſerve them ſound till they came to the *Eaſt-Indies*. But in caſe they were not able, or neglected to make uſe of ſuch Boxes, he ſeveral times obſerved, that cutting a Cheeſe in two, when they were any thing near the Equinoctial, that moſt part of it would be very dry and brittle, and ſeem'd as if it were ſpoil'd: Whereas the Parts about the middle were ſo fat and ſoft, as if all the unctuous Parts that were wanting in the dried Portion of the Cheeſe had retired thither, and was between Cream and Cheeſe. Which Conjecture was not contradicted by this, that if they cut ſome of them Cheeſes, when having left the Torrid Zone behind them, and had made a good Progreſs in the Temperate Zone, they found the external Portion good, and the Conſiſtence of the Cheeſe uniform enough.

Quere, Whether the moiſt Particles that flie in the Air, be not the great Cauſe of all Corruption of Bodies, ſince *Acoſta* ſays, that in *Peru*, where it ſeldom rains, all things, like dead Bodies, keep a great while uncorrupted? The like may be obſerved of *Egypt*, if it be not to be rather imputed to the Nitrous Salt with which the Air of that Country ſo much abounds. Mr. *J. T.*

A Man of Letters, that divers times croſſed the Line in great *Portugal Ships*, anſwered me, That when they came near it and under it, he obſerved among other things, that there was a very manifeſt Change made in the Conſiſtence of their Bisket; that moſt of their Meat, and even their Salt Fiſh was much impaired, ſo that they were ſcarce able to eat it; and that their Pilot, who had been 23 times in the *Indies*, aſſured them, he obſerved when they came to the Equinoctial, that freſh Water would not there be at all troubled or ſtinking, but clear and ſweet, as if it were but newly put into the Cask.

Doctor *Stubbs* being inquired of by me concerning, *&c.* told me, that in *Jamaica* the ſilken Stuffs that were brought thither, will rot even whilſt they keep their Colour, if they be ſhown to the Air; though if they be not ſhow'd thereto, but kept up cloſe, they were not obſerved to rot, or be diſcoloured.

TITLE XXII.

Of the Operation of the Air on the Conſiſtency *of Vegetable Subſtances.*

M*AY* 16. We opened a ſmall Glaſs-Receiver ground to a Plate of Glaſs, in which there had been included for three Years and ſome Months, (though I know not how many) the half of a Lemon cut tranſverſly, together with a Mercurial Gage: The Lemon kept its Colour pretty well, and its Shape very well, ſave that at the Orifice the upper Part of the Pulp was depreſſed, ſeeming as it were dried up by the Receſs of the Liquor contain'd in it; which Liquor did now ſtagnate upon the Glaſs-Plate. When this began to be disjoined from the upper Glaſs, there ruſh'd in, not without Noiſe, a pretty deal of external Air, which argued that the Air afforded by the included Lemon in ſo long a time, had not been near ſufficient to fill the Cavity of the Receiver. Neither the half Lemon nor the Liquor had any ill Scent, or other ſign of Putrefaction or Corruption; neither of them had the leaſt Mould, which gave me a Suſpicion, as far as it could be grounded upon this Experiment, that ſuch a Mould as might have been expected, being (as may be gueſſed by the Microſcope) a *Congeries* of a very ſmall kind of Vegetables, could not any more than many greater ones, be produced without the Concurrence of the Air. The Liquor was clear enough, and without *Fæces*, being in Colour between brown and reddiſh. It contained an acid Taſte; and when I put a little of it upon Sirrup of

Violets, it turned it to a Purpliſh Colour ; and which is more, being put upon ſmall Fragments (not Pouder) of red Coral, preſently began manifeſtly to corrode them, and that in the Cold.

To the Heat and piercing Moiſture of the Air combin'd together, may be referr'd the Obſervation of an intelligent Scholar, from whom, when I ask'd him what he had taken notice of about theſe Qualities, when he ſail'd under or near the Line, (which he did ſeveral times) he told me, that divers Paſtils or Lozanges that he was wont to carry in his Pockets, were ſo diſſolved, that they ſpoil'd his Pockets, and obliged him to cut them out, though the Paſtils of the ſame kind did never loſe their old Conſiſtence till he came near the Equator, nor keep their new Conſiſtence after he had paſſed ſome Degrees beyond it, but grew ſolid again as before.

TITLE

TITLE XXIII.

Of the Operation of the Air on the Conſiſtency of Mineral Subſtances.

INquiring of an ingenious Swediſh Gentleman that was a great Dealer in the Metals his Country abounds with, whether the great Cold of ſharp Winters in thoſe Northern Climates had not a ſenſible Operation upon Iron: I learned from him, that in the chief Copper Mine (which he had curiouſly viſited) being to draw up the Oar from an exceeding great Depth, they faſtned their Baskets, not as they uſe in other Mines, to Iron Chains, but to Ropes made of Ox or Bull-Hides; and that chiefly for this Reaſon, That during the hard Winter-Froſts that are there uſual, the Links of their Iron Chains were very ſubject to be broken by the great Cold joined to the Weight of the Oar, to the great Danger, and oftentimes the Deſtruction of the poor Workmen that were digging beneath: which Inconvenience was avoided by imploying Leather, which the Cold could not make brittle, inſtead of Iron.

Asking an ingenious Maſter of a Glaſs-Houſe, whether he had not obſerved that Glaſſes, though as well neal'd as is ordinary, would ſometimes of themſelves break with a Noiſe long after; he anſwered me affirmatively: adding, That particularly having one time had an occaſion to lay by for about half a Year or longer, a numerous Parcel of Glaſſes, when he came to take them out, he found that about a fourth Part of the whole Batch was frozen of themſelves; and that in moſt or all of them, the Cracks proceeded from ſome ſeeming Stone or great Grain of Sand, which yet indeed was not Sand, but ſome part of Salt that had not obtained a ſufficient Comminution.

A learned Gentleman that is Owner of an Iron Mine, informs me, that he has a Houſe in *Suffolk* within 6 Miles of the Sea; and though the Houſe be but 80 Years old, yet the Iron Bars of the Window that look towards the Sea, are ſwelled, and (as he calls it) rotten, being brittle, and eaſy to be crumbled into Pouder. And when I asked him whether the Wind that came from the Sea to theſe Windows were not Southern, he anſwered affirmatively. And to confirm what I was ſaying of the Operation of Sea-Salt upon Iron, he told me, that having had occaſion to cauſe many Bars of Iron to be laid in a Place upon the Neighbouring Shore, above the high-Water-mark, a great Storm chanced to increaſe the Tide ſo far as to drench thoſe Bars for ſome Hours after; which remaining in the Air, they were very much impaired, great thick Flakes being eaſy to be ſtruck off from them when they came to be hammer'd.

A very experienc'd Maſon informed me, that the Cathedral of *Saliſbury* is made of *Purbeck*-Stone, which in the Air grows ſofter and ſofter, and will moulder away; and ſo will ſome *Blechington*-Stone, though not expoſed to wet; whereas the Stones dug up at *Painſwick*, within four Miles of *Gloceſter*, being very ſoft and friable at firſt, will by lying in the Air (as he has particularly obſerved) acquire a Cruſt-hard and Glaſſy like Marble; and the oftner 'tis waſhed, the ſooner will it acquire this hard and yellowiſh Cruſt, which reaches but a very little way (ſcarce the Thickneſs of half a Crown) beneath the Surface contiguous to the Air.

TITLE XXIV.

Of the Air in reference to Fire *and Flame.*

A Gentleman of my Acquaintance being ask'd by me about the burning of Candles in Grooves (or Sutts) that are not furniſh'd with Air-ſhafts, he told me, that the Depths I deſired to be informed of were very uncertain, and varied conſiderably, according to the different Nature of the Soil, and perhaps other Circumſtances, ſo that ſometimes a Candle would go out much ſooner, and ſometimes it would continue burning, though it were let down to the Depth of eight, ten or more Fathom. That when they come into cloſe Ground, though their Candle will burn at firſt, yet after a while working, (more eſpecially if the Stone be full of Mundick) the Duſt raiſed by their Working will make their Candles go out, ſo that they muſt leave working for a time, except they will be at the Charge of conveying down Air by Pipes. I mention this as different from other ſorts of Damps. *N.*

Experiments touching the Relation between Flame, Air.

THE burning of Candles, *&c.* under a Glaſs Bell.

The burning of Spirit of Wine under a Glaſs Bell.

The burning of Match, Touch-wood, Sponck, *&c.* under a Bell.

The keeping of Animals under the ſame Inſtrument whilſt the Flame is burning.

The burning of Bodies to Aſhes in ſeal'd Glaſſes.

The doing the like in exactly cloſed Receivers.

The burning of Cotton in a ſeal'd Glaſs.

The burning of the Mixture of Flames under Water in an E. R.

The burning of Spirit of Wine and Oil of Turpentine in Glaſs Veſſels with ſlender Necks.

The Experiment of burning Gun-Powder.

Another of the Piſtols not firing in an E. R.

The burning of a ſaline Subſtance in an E. R.

The burning of Mixtures of Salt-peter in an E. R.

TITLE XXV.

Of the Air in reference to Fermentation.

Novemb. WE took a ſmall handful of Raiſons, and having put them into a Bolt-head, (not large, but half filled with Water) we drew out the Air, and then we removed the Portable and exactly cloſed Receiver, and put it on the Digeſtive Furnace, that the Warmth of that Place might promote the Fermentation in ſpight of the Unfavourableneſs of the Seaſon of the Year. After a while there appeared Signs of Fermentation by the emerging of the Raiſons, which ſwam for ſome Days on the Top of the Water, moſt of them beſet with numerous Bubbles; nor did above very few of them ſubſide at laſt, though after ſome Days the Bubbles grew fewer and fewer, and there appeared a Sediment at the Bottom of the Glaſs.

A Fortnight after they were firſt ſealed up, the upper part of the Glaſs was accidentally broken whilſt I ſtood by; whereupon the external Air ruſhed in with ſome Noiſe: and I taking the Veſſel in my Hand, perceived the Surface of the Liquor to be overſpead with Bubbles, almoſt like the Froth of Bottle-Drink: there ſeem'd to me to come out at the little Orifice made where the *Apex* was broken off, a viſible Fume, which had a ſomewhat languid Smell. The Liquor was high colour'd of the Raiſons, and ſeem'd to have extracted ſomething from them that gave it a better Conſiſtence than that of Water.

TITLE XXVI.

Of the Air as the Receptacle of Odours.

TITLE XXVII.

Of the Operation of the Air on the O-dours of Animal Subſtances.

MAY 23. We opened an exhauſted Receiver, wherein was pretty Store of Verjuice, or green and ſour Grapes. And though they had lain there we are ſure about three Years, and poſſibly much longer, yet there appear'd no Mouldineſs at all upon any of them: But the Surfaces of the uppermoſt Grains were ſomewhat diſcoloured, perhaps by a ſaline and confuſedly formed Efflореſcence, which having look'd upon through a Glaſs, and alſo taſted, I gueſſed to be a kind of Tartar. The like Liquor that the Grains had afforded had an acid Taſte, and would in the Cold corrode Coral, but the Grains ſmell'd ſomewhat muſty. In all this time the Verjuice had produced ſo little Air, that we could ſcarce take notice of it by the Mercurial Gage that had been ſhut up with it.

I inquired of my Lord of *Sandwich*, and a couple of Gentlemen that accompanied him, whether it be true which is reported of the Purity of the Air at *Madrid*, that though they have no Houſes of Office, but every Night throw out their Excrements into the Streets; yet by the Morning there remains no more Smell of them. To which I was anſwered, That 'twas true the Excrements were ſo diſpoſed of, but that *Madrid* is the ſtinkingſt Town they ever came into; yet that 'twas difficult to diſcern in the Morning any peculiar Smell of what had been caſt into the Street by Night;

but they jointly affirmed, that the Place where the Ambaſſador's numerous Family reſorted to make Water in, did not ſmell of Piſs; and that they often obſerved the Dogs and Cats that lay dead in the Streets were deprived of Stench: and his Lordſhip ſuppoſed that the Stench of a dead Mule would in few Hours vaniſh.

TITLE XXVIII.

Of the Operation of the Air on the Odours *of Vegetable Subſtances.*

MAY 16. At the ſame time we opened another ſmall Receiver, wherein above three Years before ſome large Pieces of Orange had been included: The Rinds of theſe were much diſcolour'd, their Surfaces being almoſt black. They had ſcarce afforded any Liquor, and yet we could not perceive the leaſt Mould in any of them, nor had they a putrid Smell.

TITLE XXIX.

Of the Operation of the Air on the Odours *of Mineral Subſtances.*

TITLE XXX.

Of the Operation of the Air on the Taſtes *of Animal Subſtances.*

HE anſwered me, that they could very well preſerve Meat, as Beef, without ſalting it, as long as the Froſt laſted, that is, during the whole Winter. But when it was once thorowly frozen, they could not dreſs it ſo as to make it reliſh like good Meat. Mr. *Nickſon.*

TITLE XXXI.

Of the Operations of the Air on the Taſtes *of Vegetable Subſtances.*

TITLE XXXII.

Of the Operations of the Air on the Taſtes *of Mineral Subſtances.*

TITLE XXXIII.

Of the Operations of the Air on the Colours *of Animal Subſtances.*

ENquiring of a Man of Letters, that had the Curioſity to travel into the Inland Parts of *Braſil*, whether in that Countrey the Air had not a great Influence upon the Colours of Clothes: He told me it had, and even upon Black; inſomuch that a kind of black Taffety, which is the uſual wear of the better ſort, will, after it hath been worn a very few Days, degenerate into an Ironiſh Colour: yet he anſwered me, that in the Shops where 'tis carefully kept from the Air, the Taffety continued of a good Black.

Nor is it only upon the Colour of Stuffs, but of Animals too, that he ſays the Braſilian Air has an Operation; for he ſays, that at a Place 50 Leagues beyond *Parigna*, there is a Region where white People do in a very ſhort time grow *Baſannez* (or tawny,) though a little way out of that particular Region, as for Inſtance beyond it, they quickly recover their wonted Colour.

He told me, that upon *Charleton* Iſland they have Flocks of certain Birds, which the Engliſh there call Partridges, though they reſemble ours more in Bulk than Shape, being ſomewhat like wild Pigeons, but a good deal bigger: Theſe he ſays are white in the Winter, and gray in the Summer.

TITLE XXXIV.

Of the Operations of the Air on the Colours *of Vegetable Subſtances.*

A Learned Man that was Phyſician to the Governor of *Jamaica*, being at his Return ask'd divers Queſtions by me, concerning that Iſland, gave me among others, the following Anſwer: *Lignum Vitæ*, ſaid he, and moſt other Trees at *Jamaica*, when they are newly cut down, where-ever you cut the Wood, that part which is expoſed to the Air will quickly grow green, though that which is a little beneath it be yellow, or of another Colour; and this *Lignum Vita*, when green, is as ſoft as Oak, or ſofter; and many other *Jamaica* Woods that are ſoft, when newly cut down, will afterwards ſo harden in the Air, that ordinary Tools will make no Impreſſion upon them; and the Nails that pierced them eaſily before, can no more be forc'd out of them; and this is chiefly conſpicuous in the Cabbage-Tree, which being a Wood ſoft enough when 'tis cut down, the Pith which is very copious will quickly rot of it ſelf, and the reſt of the Tree ſerves for a Pipe of perhaps 100 Foot long, that will not corrupt under Ground, but grow almoſt as hard as Iron.

Enquiring of an inquiſitive Traveller, what he had obſerved about the Power of the Air, which I had been inform'd was great, in working upon divers Bodies at the Iſland of St. *Jago*: He told me, that he and his Company ~~had not~~ ſtaid long enough there to make much Obſervation of that kind; but that ſeeing Aloes growing plentifully there, they had gathered ſome Plants of it, whoſe Juice he found, as I have here in *Europe*, to be very clammy, and exceſſively bitter, and, which was wondred at, of a very dark Colour; but having carried them in the Ship towards the Equinoctial, they found for a time the Juice to be altered, having loſt almoſt all its Bitterneſs, and acquired a green Colour.

Stains of Linen will beſt go out at the time of the Year, when the Fruits or Plants whoſe Juice made them, are in their Prime: This a Gentlewoman aſſured me ſhe had tried in new Linen ſtain'd with Juice of Quinces; and the Lady *N. N.* affirmed, that ſhe had particularly tried it in Stains made with the Juice of Hopps, which ſhe ſays are the worſt Stains of all; and which having in vain tried to get out of her Linen, ſhe laid up her Linen in her Cheſt, and at the time of the Year when Hopps flouriſh, ſhe found the Stains vaniſh of themſelves.

TITLE

TITLE XXXV.

Of the Operations of the Air on the Colours *of Mineral Subſtances.*

A Conſiderable Inſtance of the Changes that the Contact of Air is able to produce even upon ſolid Minerals, I gave thoſe that ſaw it by the following Experiment. We took one part of *Lapis Calaminaris*, and about four Parts of good Salt-peter; theſe being well pouder'd and mix'd, were put into a ſtrong Crucible, and kept in a vehement Fire ſome Hours, by which means the Matter, as we expected, was alcaliz'd: upon the thus prepared *Lapis Calaminaris* we poured a convenient Quantity of fair Water, which afforded us a Solution that was ſomewhat muddy, but appear'd of a deep red: this we pour'd into a wide-mouth'd Glaſs, which we ſet in a Window, that it might be the more acceſſible to freſh Air. There after a while our darkiſh red Solution turn'd quite green, and more Diaphanous than before; but continuing for ſome Days to keep the Glaſs in the ſame Window, (which reſpected the South) we found our green Solution to loſe its Colour by Degrees, and at laſt to be reſolv'd into a tranſparent Liquor, and a ſubſiding Pouder, that was not at all green, but red, or like Brick-Duſt. Theſe Changes of Colour ſucceeded in more than one Parcel of our Mineral Solution.

We took a very ſtrong Spirit of Vinegar, and boiled it a while on crude Filings of Copper, without finding that 'twas manifeſtly coloured by that Operation, nor yet by letting it lie ſome Hours in the ſame Glaſs Egg wherein it had been boiled. Wherefore ſuppoſing this want of Coloration to depend upon the Air's not co-operating in the beſt manner it might eaſily be made to do, we poured the Liquor and the Filings together into a broad flat Glaſs, (which we plac'd in a Window ſhelving) ſo that though the Filings were wet, yet but one part of them was cover'd to any Depth by the *Menſtruum.* This done, we obſerved, as was expected, that the Filings expoſed to the Air, changed Colour, and became of a greeniſh Blew; whilſt thoſe that were under the Liquor manifeſted no Change of Colour, but kept that which belongs to Copper, till the *Menſtruum* evaporating by Degrees, they alſo being acceſſible to the Air, acquir'd the ſame Colour with the former Vinegar. *Q.* Whether in a longer time the Coloration would not have been made?

We took ſome Filings of Copper, and divided it into two Parcels; one we put into a flat and ſhallow Glaſs with a wide Mouth, and the other into a Glaſs Viol, whoſe Neck was of the Breadth uſual to ſuch Veſſels. Upon each of theſe Parcels of Filings we pour'd a convenient Quantity of one and the ſame ſtrong Solution of *Sal Armoniac* made in fair Water, and without covering each of the Veſſels, let them ſtand by one another for a competent time. Of which Trial the Event was ſuch as was expected; namely, that the Liquor in the Viol was but faintly colour'd, when that in the open Glaſs, that had a large Surface expoſed to the free Air, was very richly tinged. And this Circumſtance is not to be forgotten, that whereas all the lower part of the Solution was of a deep Blew almoſt like Ultra-Marine, that part which was contiguous to the Air was cover'd over with a kind of Film like thin Ice, which was of a very differing Blew, exceeding like that of the finer ſort of Turcoices.

We took two ſmall Parcels of Filings of Copper, and put each of them into a ſmall Piece of Paper, with the Edges turn'd upward, and then put upon each of them three Drops of good Spirit of *Sal Armoniac*. One of theſe Papers we left in the Window, the other we put into a ſmall Receiver, which by help of our Engine was emptied in little more than a Minute of an Hour. At the End of two Minutes, after the putting on of the Spirit, there appeared a manifeſt Blew on ſome Parts of that Paper that was left in the Window; but that which was in the exhauſted Receiver, being deprived of the Air that ſhould befriend its Operation, continued there full a quarter of an Hour or more (by a Minute Clock) without appearing to be at all colour'd: Wherefore taking off the Receiver, we remov'd the Paper to the ſame Window where the other ſtood, and within about two Minutes it began to diſcloſe a Blewneſs, which within about two Minutes more was conſiderably heightned.

Into a ſlender Viol, wherein we put a convenient Quantity of the Volatile or Urinous Spirit of the Lees of Wine (elſewhere by us deſcribed) which was of a yellow Colour, we let fall ſome Filings of Copper; and ſtopping the Glaſs well, we drew a Tincture, which according to Expectation was manifeſtly green, but not of the pleaſanteſt and moſt tranſparent ſort of green Liquors; then ſuffering the Viol to reſt in a Window for many Days, we obſerved that the Liquor did then but ſlowly return to a yellow Colour, which when it had acquired, without any Mixture of Greenneſs; we open'd the Viol for a very little while to let in the Air, and then ſtopp'd it well again; the admitted Air quickly ly began to change the Surface of the Liquor into a green Colour; which, though ſlowly, extended it ſelf downwards, till it had tinged the whole Liquor. This Colour afterwards, by long ſtanding, did by Degrees grow to a pale Yellow.

The 19*th* of *Auguſt* preſented me with ſome Phænomena that made me almoſt deſpair of reducing all thoſe of our variable Liquors to a ſettled Theory. For coming that Day at about ten a Clock in the Forenoon to a Cloſet where I kept ſeveral Vials furniſh'd with this Liquor, I perceived one of them that ſtood in the Window, that had once almoſt quite loſt its Colour, to have re-acquired a very fair Blew, at leaſt as deep as that of the Sky in a fair Day. This Viol I the rather watch'd, becauſe I had taken notice, not without ſomewhat wondring at it, that for two Days before, inſtead of loſing, according to Cuſtom, the little Remains of Colour, that after many Days ſtanding it yet retained; the Colour began again to increaſe, though the Viol were conſtantly kept ſtopp'd as before; and that which made this regaining of the Colour ſeem more ſtrange, was, that there ſtood juſt by it another Viol furniſhed with the Spirit, and with Filings taken out of the ſame Parcels, yet the Liquor of this Parcel continued colourleſs. Wherefore ſuſpecting that ſome Accident might have happened, whereby ſome little Portions of Air might have inſinuated themſelves thorow the Cork of the altered Liquor, I caſt up my Eyes to another Viol that ſtood in ſo high a Place that was not eaſy to reach it, and where it had long reſted, and loſt its Colour: But upon this View I was confirmed, that the Change lately mentioned in one of the Viols, was not from the Cork, but from ſome unobvious Cauſe: For though this upper Viol was furniſh'd with a good Glaſs Stop-

ple;

ple; yet the Liquor it contain'd was again grown Cæruleous, though the Liquor of another Viol that ſtood juſt by it continued colourleſs. Wherefore to ſatisfy my ſelf further, I preſently went to a private Place, where I had in a Cavity made in the Thickneſs of a Wall ſet aſide two Viols, that ſeveral Days before had quite loſt their Colour; and my former Surprize was increaſed, when I found that one of them which was ſtopp'd with a Cork, continued colourleſs; yet the other that had a Glaſs Stopple, and ſtood juſt by it, had regain'd a fair Cæruleous Colour. Both theſe were fitted for Trial, with the ſame Spirit and Filings, and the ſame Day with the others above-mentioned; and the Heat of the Weather had ſo little Influence upon this Effect, that this Day was remarkably cold, being made ſo by a Northern Wind, which made me obſerve it more ſo than I had found it for ſome time before.

I muſt not forget on this occaſion, that I was invited by the foregoing Phænomena, to look upon ſome Spirit, not Oil of Amber, that I had kept in a Viol for ſeveral Days upon Filings of Copper, and had ſometimes expoſed to the Air by unſtopping the Glaſs, and found, that though formerly the Spirit kept its native Colour better than I deſired, yet it had acquired a green Colour, which whether it will loſe again by longer ſtanding, Time muſt determine.

The ſlender Viol, with Spirit of Honey mention'd N° the though it had been wont to exchange its yellow Colour for a blew, by the Contact of the external Air in a very ſhort time, and ſometimes within a Minute or two; yet being open'd this Afternoon, in the ſame Place where it uſed to be ſo, did not in above an Hour's time turn blew, but remain'd a tranſparent yellowiſh Colour.

The Viol with a Glaſs Stopple, mentioned N° 945. being for divers Weeks left unſtirred in the Window where it ſtood before, I ſeveral times obſerved it to loſe and regain Colour; and though ſometimes it would only appear of a more faint or a more rich Blew, yet ſometimes alſo it would appear either quite or almoſt colourleſs, and perhaps in a Day or two after it would be again as blew as the Sky. And this, though I could not find that any thing in the Weather was the true Cauſe of this Change, ſince the Liquor would not only gain, but loſe Colour in colder Weather; and ſo it would alſo do in warmer: But on Michaelmas-Day I found it to have attained a deep Blew; and though ſince it has been now and then ſomewhat more dilute, yet during all the paſt Month of *October*, I remember not to have ſeen it any thing mere *colourleſs*; and this Day being the firſt of *November*, I found it to have reſumed a high Colour, though a Viol with a Glaſs Stopple, which had for many Weeks ſtood juſt by it, and formerly did divers times correſpond with it in its Changes, has continued all the laſt Month of a very pale Blew, without either deepning its Colour, or growing quite colourleſs.

An inquiſitive Gentleman of my Acquaintance, being ask'd by me about a Mountain in *Wales*, called , where ſolid Stones are ſaid to change their Colour very oddly, told me, that within ſight of that Hill, in a large Piece of Ground that was then newly put under Tillage, he ſaw good Numbers of Stones that look'd like Flints, and were full as hard, if not harder; the Colour of moſt of them was dark, the reſt grey: theſe Stones, which when the Ground was newly turn'd up, were Ruſt-coloured, he obſerved afterwards to grow lighter and lighter coloured; ſo that after three or four Years, being invited by this Obſervation to take notice of it at his coming to that Place again, he found theſe Stones almoſt all of them turn'd white. About which Phænomenon, queſtioning the ancient Inhabitants, with ſome Expreſſions of Wonder, they ſeem'd to make little of it, and aſſured him, in the Neighbouring Mountain almoſt all the Stones that were expoſed to the Air, underwent the like Changes, and within a few Years were blanch'd.

Having put ſome *Mercurius ſublimatus dulcis*, and *Vitriolum Romanum* (tied up in ſeveral Papers apart) into one Box, at the end of twenty two Months I found the ſublimate Mercury wholly changed into a Subſtance ſo like Antimony, that ſome not ignorant of the *Materia Medica*, have taken it for the ſame: and the Superficies only of the Vitriol had acquired the ſame Colour, but was not at all altered within. This from a credible Relator.

TITLE XXXVI.

Of the Air deſtroying or introducing other leſs obvious Qualities *into Animal Subſtances.*

TITLE XXXVII.

Of the Air deſtroying or introducing other leſs obvious Qualities *into Vegetable Subſtances.*

AN intelligent Gentleman that ſtaid a Year in *Guinea*, related to me, that he and his Company found the great Heat and Moiſture of the Air to diſpoſe Bodies ſo to Putrefaction, that he obſerved the white Sugar to be ſometimes full of Maggots; and found that divers Drugs, Salves, and other medicinal things that were brought with him, had quite loſt their Virtue; and ſome of them, eſpecially Ointments, were verminous. And he added, that in the Iſland St. *Jago* (one of thoſe of *Cabo-verde*) they laid ſtore of Sweet-Meats upon Tables to the Heat of the Sun, to dry up the ſuperfluous Moiſture, which in ſtrange Abundance they had contracted the preceding Night, which otherwiſe would quite ſpoil the Sweet-Meats, and bring them to putrify.

Oxford, though ſeated for the moſt part of it on a gravelly Hill, I have known to be very diſagreeable to ſome moiſt Splenetick and Valetudinary Bodies, who I have heard complain, that they could not be ſo well there as elſewhere, eſpecially in the Spring; ſo that I take the Air of that Place to be generally moiſt. Mr. *J. T.*

Air too dry, though ſufficiently hot, is not favourable, for the Production of divers Inſects: for I have obſerved theſe two laſt dry Springs, that there has been no ſoft Garden-Snails to be found abroad, and very few Fleas bred in the Houſe, which I impute to extraordinary long Drineſs of the Air, for want of moiſt Vapors to nouriſh them; ſince in wet Summers we always ſwarm with Snails, Gnats, Fleas, *&c.* whereas this Year we have few or none.

TITLE

TITLE XXXVIII.

Of the Air deſtroying or introducing other leſs obvious Qualities *into Mineral Subſtances.*

Zwelfer, *pag.* 800.

OBſervandum etiam quod Antimonium Diaphoreticum quocunque modo, ſive cum ſolo Nitro aut addito etiam Tartaro, paratum ſit, tractu temporis aeri expoſitum pravam, & quaſi malignam induat naturam, ſumptumque intra corpus cordis anguſtias, cardialgias, lipothymias, vomituſque & ſimilia prava Symptomata procreet, quæ facilè tamen evitabimus, ſi ~~vel ſingulis diebus vel tribus menſibus recenter illud con~~ficiamus, vel jam paratum Antimonium diaphoreticum vetuſtum additâ portiunculâ Nitri, aut etiam abſque Nitro, per unam vel alteram horam Vulcano tradamus, penituſque igniamus, iterumque ſi Nitrum additum fuerit, edulcoremus, & parumper reverberemus.

Purchas's *2d Part, lib. 6. cap.* 8. *A vulgar Experiment generally affirmed, as by* Alpinus in Med. Egypt. l. 4. c. 8. *who long liv'd here upon the Teſtimony of* Paulus Moucilus, *the French Conſul,* Baptiſtæ Elianus *a Jeſuit, and* John Varot *an Engliſh Man.*

To prove that it proceedeth from a natural Cauſe, this one, though ſtrange, yet true Experiment, will ſuffice. Take of the Earth of *Egypt* adjoining to the River, and preſerve it carefully, that it neither come to be wet nor waſted; weigh it daily, and you ſhall find it neither more nor leſs heavy until the 17*th* of *June*, at which Day it beginneth to grow more ponderous, and augmenteth with the Augmentation of the River, whereby they have an infallible Knowledg of the State of the Deluge, proceeding, without doubt, from the

Humidity of the Air, which having a Recourſe through all paſſible Places, and mixing therewith, increaſeth the ſame as it increaſeth in Moiſture.

A learned Phyſician of the Colledg of *London* confeſſed to me, that he found by his own Obſervation, that *Antimonium Diaphoreticum*, being kept ſome Years, though in a cover'd Veſſel, acquir'd a Vomitive Quality, which it had not before; and that having long kept in a ſtopp'd Glaſs a Parcel of his own Ceruſs of Antimony, of which he uſed to give 12, 15, or more Grains, without finding it Emetick; he found that in proceſs of time it was ſo degenerated, that when he gave four or five Grains, it would cauſe Vomits.

Earth laid up together in the Air for four, five or ſix Years, does make far better Pots for Cloſeneſs, and holding of the Fire, than that which has lain but one Seaſon above Ground, though that it ſelf be much better than that which is newly dug up, which will be very apt to crack in the Fire, or when it comes to wet; as alſo thoſe Bricks that lie at the Top of the Furnace, and therefore are not ſo thick covered as they burn, and are apt to deceive Builders when they come to be expoſed to the Rain and Weather.

TITLE XXXIX.

Of the Air in reference to the Propagation and Vegetation *of Plants.*

AN ingenious Traveller that frequented the Pyrenean Mountains, eſpecially that which many count the higheſt of them, and is known by the Name of *Pic de Midi*, affirmed to me, that he, as well as ſeveral others, had manifeſtly obſerved a ſcarce credible Difference between that Side of thoſe Mountains that regards *France*, and that which reaches to *Spain*; for at the ſame time the former was verdant and flouriſhing, and yeilded a delightful Proſpect to the Traveller, as well as plentiful Proviſions to the Inhabitants: the Spaniſh Side of the Hills was parch'd, and ruſſet, and barren, and look'd diſmally, like a Wilderneſs: Which great Difference of Countries, obſervable in the ſame Hills at the ſame time of the Year, he imputed to the fierce Parching, and ſometimes blaſting Winds beat upon the Spaniſh Side, and made that look ſo ſquallid, whilſt the Hills that ſuffer'd this Miſchief on one ſide, did by their Height check theſe hurtful Winds, and skreening from them, the French Side of the Mountains left them to injoy Advantages that the Soil and Climate furniſhed them with.

TITLE XL.

Of the Air in reference to the Generation, Life and Health *of Animals.*

DE vita igitur ac morte, & iis pene omnibus quæ huic conſiderationi affinia ſunt, dictum eſt. De ſanitate verò morboque non ſolùm medici ſed & Phyſici eſt, cauſas quadantenus referre. Quatenus verò hi differant, & quatenus diverſa contemplantur ignorare non convenit. Equidem quòd confinis ſit quadantenus hæc Medici Phyſicique Tractatio, & res ipſa teſtatur. Nam & Medici, quicunque paulò elegantiores & diligentiores ſunt, de natura dicunt, & artis ſua principia inde ſumere dignantur; & Phyſici omnes fere, qui concinnitatis aliquid habent, tractationem naturæ uſque ad medicinam perſequuntur.

Ariſtot. de Reſpirat. cap. 21. & parag. 87.

Auguſt 13. The Temperature of the Air, both as to Salubrity and other Regards, may be deriv'd as well from the ſubterraneal Steams, as the ſuperficial Effluviums of the Earth, and both theſe ſorts of Steams being variouſly tranſported and ſhuffled, and compounded by the Winds and other Motions of the Air, upon the Mixtures of them, the local Qualities of the Air, in differing Places, may be ſuppoſed to reſult.

About three Months before the late great Plague began in *London*, (in the Year 1665) there came to Dr. *M.* a Patient of his, to deſire his Advice for her Huſband; and the Doctor having inquired what ail'd him, ſhe anſwered, that his chief Diſtemper was a Swelling in his Groin, and upon that occaſion added, that her Husband aſſured her of his being confident that the next Summer the Plague would be very rife in *London*: for which Prediction he gave this reaſon, That in the laſt great Plague he fell ſick of that Diſeaſe, and he then had a Peſtilential Tumor; ſo in two other Plagues that ſince happened, though much inferiour to that great one, each of them had a riſing in his Body to be its Fore-runner; and now having a great Tumor in the fore-mentioned Place, he doubted not but it would be followed by a raging Peſtilence, which accordingly enſued. Having heard much Talk of ſomething of this Nature, as related by the Doctor, I inquired of him how much of it was true, and received for Anſwer the foregoing Narrative.

You did not perhaps expect that the mere local Motion of the Air ſhould be mentioned by me among the Cauſes of the Effects of its Changes: And indeed the Phænomena I have yet met with reducible to this kind, have been but very few, notwithſtanding which I ſhall take notice, that this local Motion may in certain Caſes operate on other Bodies, either as it turns the Air into a Wind, or as the tremulous Motion of the Air is modified into ſound, or as the Air is put into a vehement and diſorderly Motion by Thunder.

As to the firſt of theſe 'tis evident, that upon the Vehemence or Slackneſs, and the Places whence and where the changing Wind happens to blow, there may divers Effects enſue, eſpecially in animated Bodies. And this not only as the Wind is accompanied with Cold and Hear, or Moiſture, or Drineſs, but (to reſtrain our ſelves to Inſtances more cloſely pertinent to our preſent Purpoſe) as the Wind is *flowing* Air, or an *Aireal Stream*, for only as ſuch it may ventilate the Places through which it paſſes, and by expelling the Stagnant Air, and introducing other Air, may contribute to many of thoſe Changes (eſpecially as to the Health of Animals) that we ſee to depend upon the Alteration of Air, and perhaps among the more tender ſort of Animals, there may be found ſome in which the Motion of the external Air, though excluded by Walls and Windows, may have a conſiderable and immediate Operation: For I have learned by Enquiry from ſome curious Natives of *Languedoc* (where I had the Curioſity to look after Silk-worms, abounding in that Province) that in caſe it happened when the Worms having eaten their fill, began to diſpoſe themſelves to work their ſilken Eggs; in caſe, I ſay, it then happened to be thundering Weather, a great part of the Worms, eſpecially the leſs vigorous, would be deſtroyed.

He affirmed to me, that in ſome Mines of above a thouſand Foot deep, he ſaw Horſes that had been let down by Ropes to the 3*d* part of the Depth, that is above a hundred Yards, and that ſeveral of them died either in the letting down, or by the Change of Air; yet ſeveral of them ſurvived, and were imployed about the Engines belonging to the Mines, and ſeem'd not to have any ſenſible Inconvenience as to Reſpiration, though in the Receptacles they wrought in, they were furniſhed with Air but from the Groove through which they were let down, and by a moderately big Shaft.

An ingenious Traveller that has had the Curioſity to viſit the Mines of ſeveral Countries, as *Bohemia*, *Saxony*, *Swedeland*, *&c.* anſwered me, that the deepeſt Mine he ſaw in *Bohemia* was of about 2000 of our Feet.

An intelligent Perſon that was for many Years Conſul of the Engliſh Nation at *Tripoli* in *Barbary*; and at another time Governour of the *Caſtle* (called) *of the Coaſt*, belonging to the Engliſh African Company in *Guinea*, being diſcourſed with by me, about the Diſeaſes incident to that very unhealthy Place, and about the Worms that bred in Mens Legs, told me, That the great Noxiouſneſs of the Air was not conſtant, but frequently ceaſed, and return'd within no long Compaſs of time; inſomuch that all his Men would continue in Health for many Days together, and then on a ſudden divers of them would fall ſick, eſpecially of Feavers and Fluxes that uſually killed them in forty eight Hours or leſs.

Dr. C. chief Phyſician to the Ruſſian Emperor, confirmed to me, that being in *Ruſſia* in the Winter, when the Froſt was very hard, and the Eaſt or North-Eaſt Wind blew cold, if he turned his Face toward the Wind, and walked againſt, (which at other times he was wont, and took a Delight to do) he found himſelf unable to fetch his Breath, and almoſt ſtifled, as if the Air were very thick, or rather a great Stiffneſs brought upon the Organs of Reſpiration, whereby he was unable to move them as at other times, ſo that he was fain to turn his Head from the Wind that he might be able to fetch his Breath.

An obſerving Perſon being ask'd about a Tradition of Sea-men, that the Lice of Europeans die when the Ships paſs the Line: anſwered me, that he did not find it to be true, as it is wont to be delivered; but this he plainly obſerved in ſeveral of our Engliſh with whom he ſailed, that all the Lice quitted their Bodies, and got up into their Heads, whence they diſperſed themſelves again when the Ship had left the Equator a pretty way behind it.

But I remember that another Acquaintance of mine, that divers times paſſed the Equinoctial in Portugal Ships, which uſe to go to the *Indies* well crouded with People, many of them more poor than cleanly, anſwered me, that he had heedfully obſerved thoſe Peoples numerous Lice to die away as they croſs the Line, though in no long time after the ſame ſort of Cattle would begin to moleſt them again.

His Royal Highneſs the Duke of *York*, at his Return out of *Scotland*, having been pleaſed to diſcourſe with ſome of us, that had the Honour to be then near him, of ſome Obſervations he made in his Journey, mentioned among other things, that Agues were very unfrequent in *Scotland*, which yet that Year were very rife over almoſt all *England*. This gave me afterwards the Curioſity to inquire of a ſtudious Perſon, who is one of the chief of the Scotiſh Nobility, what he knew about the Unfrequency of Agues in his Country. To which his Lordſhip replied, that as to Quartan Agues it was generally taken notice of; inſomuch that when News was brought, that a Gentleman whom he named fell ſick of that Diſeaſe, amongſt them in the Country it was look'd upon as a ſtrange and remarkable thing. And though divers Perſons bring Quartans out of *England* to *Edinburg*, yet they ſo ſeldom keep them long there, that a Scotiſh Phyſician, whom he named to me, offered to lay five to one of the quick Recovery of ſeveral Patients of his, if they would make ſome reaſonable Stay in that City.

Roderici Fonſ. de Sanit. tuend. pag. 105, 106.

Aer autem corrigetur cauſa corruptionis ablata, & quod jam inductum eſt mali extinguendo, ſi igitur ex nimio humore aer putreſcit, ignibus accenſis qui omni putredini remedio ſunt, exſiccandus, ſic ignes, per vias

&c

& domus fiant ex odoratis plantis, qualis Laurus eſt, Mirtus, Pinus, Cupreſſus, Roſmarimus, & reliquæ ejus generis, qua ratione peſtem Athenis Hippocrates extinxit; vapores præterea maligni per aerem ſparſi, diſſipandi ſunt, id quod a magnis ventis fieri ſolet. Sic Olyſiponi, cum trium dierum ingens procella veniſſet peſtis extincta nuper eſt & in Maroco ingens peſtilentia vento quodam evanuit; qui veluti è fornace (adeo calidus erat) exire videbatur, aerem autem nos imitando ventos commovere poterimus; ſi bombardarum ſtrepitus multos fieri curemus; ſi verò vapores ex paludibus, ac ſtagnantibus aquis fieri videntur; eas reſiccare aut novare oportet frequenter, maximè per æſtatem. Renovantur autem novis ſupervenientibus aquis quas è fluminibus per canales traducere oportet; aut ſiccandæ ſunt factis rivulis, & foſſis per quæ ſuperfluant ad flumina; quod cum primus magnus Etruriæ Dux Coſmus Piſis feciſſet; & magna animi contentione, nunc faciat Ferdinandus, factum eſt, ut ſaluberrimus ejus urbis aer per omne anni tempus ſit redditus verum ſi cadaverum inhumatorum multitudo aerem inficit; magna & profunda facta fovea ſepeliantur; ſi ab immunditie, & excrementis, quæ per urbem & domos ſparguntur, id quod, ut reor Biſantii, & Olyſiponi, in cauſa eſt, cur peſtis adeo ſæviat, ac duret, mundare oportet omnia; viæ ac domus quotidiè, vel ſaltem ſemel in ſeptimanâ repurgandæ.

1. *Joh. Beguinus in Tyrocin. Chymic. lib.* 2. *cap.* 13. Dignum admiratione eſt, quod quamvis in viciniâ Hydriæ Comitatûs Goricienſis, ubi reperitur copioſe Mercurius, ſingulis ferè annis Lues peſtifera graſſatur, illa tamen ſemper immunis ab hac manere ſoleat, idque viri provectæ ætatis ſe obſervaſſe, & à majoribus ſuis acce-

piſſe, mihi ſanctè confirmarunt. Hinc patet, Mercurium eſſe ſummum omnis putredinis ac corruptionis alexipharmacum. 2 *Michael Majerus in luſu de Mercurio.* Argentum vivum eſt plurimorum morborum alexipharmacum, & ut teſtantur quidam, ipſius Peſtis (cum eo loco ubi Mercurius effoditur, & tractatur, nunquam aut rariſſimè hoc Contagium graſſetur) dummodò maneat in ſuâ propriâ naturâ, & non à ſalibus aut aquis corroſivis inficiatur, ac venenoſus reddatur.

A very ingenious Phyſician that travell'd much in the *Eaſt-Indies*, and viſited ſome Iſlands in the South-Sea, to which our Engliſh were not permitted to have Acceſs, being ask'd of me ſome Queſtions about the Effects and Changes of the Air in thoſe Parts, related to me, that having made ſome ſtay in the fam'd Iſland of *Ternate*, he learned, that the Dutch (who had maſter'd the Inhabitants) did, upon a Compoſition made with the King for his Damages, cut down almoſt all the numerous Clove-trees that grew in that Iſland, that thereby they might keep up the high rate of that Spice, as indeed they have done. Whereupon there happened a Change in the Temperature of the Air, that gave cauſe to conclude, that the Exhalations of the Bloſſoms which (being dried) afford the Cloves, were not only very pleaſant, but very healthful too: For no long time after the Exciſion of theſe fragrant Trees, the Iſland became very unhealthful, which this Phyſician very probably imputed to the corroſive and noxious Steams, which plentifully iſſuing out from a kind of Vulcan, or ſmoaking, and ſometimes burning Hill, depraves the Air of that Iſland that is but little, but had their hurtful Effects formerly prevented by the Aromatick and benign Emanations of thoſe numerous Bloſſoms and Trees that richly impregnated the Air, and by their volatile and oily Salts, oppoſed and hindred the Effects of the ſulphureous, and other ſharp Steams of the Vulcan. And my Relator aſſures me, that this Change of the Air's Conſtitution was ſo remarkable, and acknowledg'd when he was there, that whereas formerly ſick and valetudinary Perſons uſed to be ſent thither from *Batavia* to recover their Health by the Goodneſs of the Air (as we often ſend conſumptive Perſons into *France*) the Air at his being in *Ternate* had been for divers Years ſo unhealthful, that the Dutch were fain (from *Batavia*, or other more healthy Places) to ſend Men twice a Year to releive the Gariſons, and bring back the many ſick they uſually found at their Arrival in that formerly healthy Iſland.

An obſerving Phyſician lately return'd from *Tangier*, anſwered me, that though otherwiſe it be a healthy Place, he took notice that 'twas not unuſual for new Comers to find themſelves feveriſh for many Weeks, or ſome Months after their Arrival, eſpecially if the piercing eaſterly Wind happened to reign. This, he ſays, he found in himſelf, not only by a conſtant Heat and ſome other Symptoms, but by that main one of the præternatural Quickneſs of his Pulſe. He added, that this Diſeaſe, though very mild, held him near four Months: When the Eaſterly Winds happened to blow, on which his Feaveriſhneſs ſo depended, that he could eaſily, when he awaked in the Morning, know without asking whether that Wind blew or not.

May 16. We put into a ſmall Receiver five or ſix little Ants, which run about very briskly; but the Air being pump'd out, they preſently loſt their Motion, which they ſoon recovered upon the reſtoring of the Air to them. Then the Air was again withdrawn, and

the Inſects thereby brought to lie (ſome upon their Backs) as ſtark dead: in which Condition they were ſuffered to remain about five or ſix Hours; after which the Air being let in upon them, they nevertheleſs continued ſeemingly dead for many Minutes, (as we gueſſed between 15 and 30) but at length all recovered, running nimbly up and down the Glaſs, though it were late at Night.

Relatione della Provincia di Malavar. pag. 64 & 65.

Si Patrono queſte barche dalla coſta della peſcaria, e vanno all iſola di Ceilam, nella coſta della quale per la lunghezza di venti miglia, tre ſole miglia lontane da terra, ſette braccia abbaſſo arrivando ſino alli dieci nel fondo, ſi ritrova infinita quanta di madreperle, eſcono per queſta peſca le barche la matina col vento di terra, & arrivando al poſto delle madreperle, gettare l' ancore, e fermareſi in quel poſto, cominciano a tuſtarſi nel mare i marinari, de quali ogni barca ne ha quindeci, e venti, e ciaſcuno di eſſiſi lega nel mezzo, con una fune, della quale ha cura uno, che reſta in barca e con un' altra fune legandoſi una pietra alla gamba, un' altro ha pure cura di quella, e cingendoſi un' ſacco di cuoio dinanzi, mettendoſi le guante alle mani, coſi legato ſi tuſta con violenza nel mare, lentando quelli le funi, e col peſo della Pietra, va con grandiſs' violenza giu, & arrivato ch' e, ſcioltaſi dalla gamba quella fune, con la quale ſta legata la pietra, reſta egli libero, & la pietra viene ſubito tirata ſoprada quello, che n' ha cura, et il marinaro poi comincia con molta ſollecitudine à pigliare quelle madreperle, che li vengono dinanzi, e le mette nel ſacco, e ſentendoſi mancare la reſpiratione, tocca la fune, con la quale ſta legato nel mezzo, e quello ſubito con grandiſs' velocita lo tira et arrivando nella barca, ſcaricando le madre perle ripiglia fiato, e dopo torna a legar-

ſi di nuovo la pietra, e di nuovo ſi tuſta come ſopra's 'e detto, e ſempre coſi per tutta la giornata. Et è tanto faticoſa queſta peſca, ch' eſſendo, tanto profunde le Madre perl nel mare, molti mancando loro la reſpiratione ſi trovano affogati.

It is, by long Obſervation and often repeated Experience, found certain, that if any Foreigner lie on ſhore all Night at *Johanna*, they ſeldom miſs to be taken with Sickneſs there, or within a few Days after their Departure from the Iſland, and are commonly ſeized with putrid Feavers, whereof moſt die in two or three Days, though thoſe that have remained upon the Place all Day-long, for ſeveral Days together, are almoſt always ſafe, if they go on board of Ship every Night about a Mile, or a little further, from the Shore. The Iſland abounds with the greateſt Variety of Plants and Trees that can be almoſt imagined in that Circumference, and is generally exceſſive hot in the day-time, but cold after Sun-ſet. Whence it may poſſibly be ſuppoſed, that the moſt volatile Parts of thoſe promiſcuous (and probably many of them poiſonous) Plants, exalted in the day-time by Degrees, and ſuddenly condenſed at Night, may by Inſpiration infect the Maſs of Blood much after the ſame manner as in Peſtilential Airs. The Inhabitants themſelves are very much ſubject to Feavers, (of what ſort I could not learn) for which they cut or ſcarify their Breaſt or Abdomen in ſeveral Places: but they obſerve that few live, except their Feaver terminates in a conſiderable number of Botches in divers Parts of the Body. There is one Hill there remarkable for Height, which is ſeldom or never free from thick Fogs or Clouds hovering over the Top of it, ſometimes higher, ſometimes lower, according as the Weather alters.

Upon the Coaſt of *Cormandell*, and moſt maritime Places of the *Eaſt-Indies*, there are ſometimes (I think yearly) Fogs ſo thick (notwithſtanding it is then very hot) that all, or moſt Inhabitants from other Nations, and the tenderer ſort of the Natives, are neceſſitated to keep their Houſes, with the Doors and Windows faſt ſhut, there being little or no Commerce at that time.

At *Balaſſore* in the Bay of *Bengale*, and in divers other Parts in that Country, there happens after great Rains, ſo great Corruption of the Air, that the ſtinking Smell is very nauſeous to the Inhabitants: which I preſume may be chiefly occaſioned by a great number of Frogs, and other Reptiles (wherewith thoſe Places abound) left upon the dry Places after the Inundation, and then putrified by the exceſſive Heat of the Sun. At this time there is great Sickneſs and Mortality amongſt the Natives, chiefly by violent Feavers.

In the return of Engliſh Ships from the *Eaſt-Indies*, they generally put their ſick People on Shore at St. *Helena*, where they find ſo ſenſible Alteration, that altho carried thither, there are few that do not recover ſo much Strength as to walk about in two or three Days, which, in all Probability, muſt chiefly be attributed to the Alteration of Air, not of Food, there being in moſt Ships much the ſame Benefit of freſh Proviſion for thoſe that are diſeaſed.

Le chemin plus court de Moſul a Bagdad, eſt par la Meſopotamie; mais on n'y trouve aucun Village, & le Samiel y regne tout l'Eté depuis Moſul juſques a Sourat; ce qui oblige a prendre l'eau, ſur le Tigre où ce vent ne Souffle point. Le nom de ce vent et composé des mots, *Sam* et *jel*, c'eſt a dire poiſon et vent comme qui diroit vent de poiſon. Ce pourroit être le vent urens, dont parle Job xxvii. 21. Lorſque quelqu’ un a reſpiré ce vent, il tombe mort ſubitement quoi qu’ il en ait quelques uns qui ont le temps de dire qu’ ils brûlent au dedans. D’ abord qu’ on eſt mort, on devient tout noir, et ſi on tire le mort par le bras où par la jambe où par un autre endroit la chair quite les os et reſte entre les mains de ceux qui la touchent. Thevenot dans le Bibliotheque Univerſel Tom. xiii. p. 266.

Doctor *Collins* relates, that in *Muſcovy* their Horſes are much ſubject to a very ſcurvy Diſeaſe, whoſe Ruſſian Name I have forgot, from which the Natives are wont to preſerve them, by keeping Goats in their Stables: And being ask’d by me, whether he had this by Tradition, or upon his own Trial? He affirmed, that he had found it true himſelf, and that he therefore was wont to keep Goats in his own Stable.

The ingenious Mr. *Rycaut*, Engliſh Conſul at *Smyrna*, being ask’d of me, whether at *Smyrna* as well as at *Aleppo*, he obſerved that the Plague that uſes to rage in the former part of the Summer, degenerates into other Diſeaſes about the latter End of *June*, and beginning of *July*: He anſwered me, that at *Smyrna* the Obſervation does not hold ſo much as at *Aleppo*; but yet at *Smyrna* they generally obſerve, that about that time of the Year, though exceeding hot, that the Malignity of the Plague does notably leſſen, for it is not quite ſo infectious, nor near ſo generally mortal as it was in the former part of the Summer. When many Years ago I heard of this ſtrange Phænomenon of the Peſtilence at *Aleppo*, I began to think whether a poſſible, though not perhaps the true Cauſe of it may not be ſuch as this: That the Peſtilential Corpuſcles that rove up and down in the Air, during the former part of the Summer, require ſuch a Bulk or Groſſneſs to enable them to exerciſe their pernicious Operations; but when the Weather grows to be exceeding hot, that Heat of the Air becomes able to diſſipate thoſe Corpuſcles, and deprive them of that Bulk that we have ſuppoſed neceſſary to their deſtructive Efficacy. For Illuſtration of this Conjecture, we may take notice of the Smoak that iſſues out of the Weik of a Candle newly blown out; for whilſt the ſooty Corpuſcles retain their Bigneſs and Texture, they are able to offend the Noſtrils very much by their Stink, and ſometimes to cauſe Convulſive Motions and Abortions in teeming Women; but if you apply a Flame to this Smoak, it preſently diſcuſſes this fuliginous Matter, and diſſipates it into Particles of quite another Nature, which by this means are deprived of all their offenſive Smell, and ſome other ill Qualities. It may alſo be ſaid, that the great Increaſe of Heat in *July*, may enable the Sun-beams, by penetrating the Earth deeper, and agitating its lower Parts ſtronger, and producing Creviſſes, and other new or formerly obſtructed Paſſages in the upper Parts of it, may elevate into the Air divers ſaline and other new Corpuſcles, which may either divide or diſſipate the Peſtilential ones, or elſe by aſſociating themſelves with them, make up new Concretions, differing from the Peſtilential Corpuſcles, in Bulk, Shape, Texture or Motion, in moſt or all of theſe, by which means the morbifick Corpuſcles being much altered, their Operations on the humane Bodies they invade, may be ſo too, and the Diſeaſes they produce may become leſs malignant, or degenerate into ſome other Diſeaſe. And if it be demanded why this does not happen elſewhere as well as at *Aleppo* and *Smyrna?* it may be anſwered, That the Concourſe of Cauſes may not be the ſame, and particularly that the Soil of thoſe two Places may be peculiarly diſpoſed to emit Peſtilential Corpuſcles of ſuch a determinate Nature, with ſuch a Degree of Heat, and diſſipable by a greater, or with a more intenſe Heat, to afford alſo Exhalations capable to correct the former, as 'tis delivered by good Authors, and ingenious Men have confirmed it upon their own Obſervation, that yearly, at *Grand Cairo*, in the Heat of Summer the Plague ceaſes to be mortal, and almoſt to be infectious, when the *Nile* begins to overflow, which wonderful Change I ſhould not ſo much aſcribe to a Frigeration of the Air, that uſually accompanies the Swellings of the Waters, (ſince Peſtilences rage in much cooler Weather than can be ſuppoſed in ſo hot a Climate as that of *Egypt* in *July*) as to ſome nitrous and other corrected Exhalations that are plentifully emitted by the freſhly arriving Waters.

There is an Account that has not, that I know of, been taken notice of, upon which the ſupervening *Coldneſs* and *Heat* of the *Air* may *pro tempore* very much alter the Qualities of it, in reference to the Bodies and Health of Men: For the Air being a fluid Body as well as Water, and impregnated with Salts of different kinds, ſome merely ſaline, and others aſſociated with ſulphureous and other kinds of Particles; it ſeems not improbable, that what happens in that groſſer fluid *Water*, impregnated with differing ſorts of Salts, and alter'd by ſucceſſion of Heat and Cold, takes place alſo in the *Air*. I purpoſely tried in Water, that by diſſolving in it convenient Quantities of two differing Salts, though whilſt the Liquor was *hot*, or perhaps ſo much as *lukewarm*, they would ſwim together undiſtinguiſhably in the Liquor, and ſo were in a Capacity to act jointly, and as the Schools ſpeak, *actione communi*, on divers Occaſions: yet when the Liquor was cold, and ſometimes when there was only a conſiderable Remiſſion of the *Heat*, the ſaline Particles of one kind, being not capable of being any longer ſufficiently agitated by ſo faint a Degree of Heat, would convene into Grains or Criſtals; and loſing their Fluidity and Motion, viſibly ſeparate themſelves from the other kind of Salts, which yet continued fluid in the Water where it could now act but by its own particular Qualities, and not as formerly, *actione communi.*

The cleareſt Inſtance I found of this Obſervation was afforded me by an Experiment made with the Solutions of Alum and Nitre; a Relation of which I find among my *Adverſaria*, in the following terms.

Equal Parts of Alum and Nitre being diſſolv'd in the ſame Portion of fair Water; and the Liquor being in good meaſure evaporated, the Earthen Veſſel that contain'd it was ſet in the cold, by which means, at the bottom and the lower part of the ſides, the Alum appear'd to be firſt coagulated in many Octaedrical Grains, no Chryſtals of Nitre yet being viſible. Afterwards, upon a further Evaporation of the Water, and the Removal of the Veſſel from the Fire, there appear'd more Grains of Alum, but as yet no Nitre: wherefore having yet further evaporated the Liquor, at length the Nitre ſhot plentifully into fine little Chryſtals of the Shape proper to that Salt.

This is the Account my Note-Book contains of this Trial, which ſeems to invite us to conjecture, that of the numerous ſorts of ſaline Corpuſcles that rove up and down in the Air, whilſt it is well heated by the Sun, or other Cauſes, ſome ſorts may by the Abſence of that Heat, or ſome ſupervening Cauſes of Coldneſs, be made to ſeparate from the others, which were thereby

con-

contemperated, or perhaps enabled to co-operate to divers Purpoſes that they were not fit for alone; and to form Concretions, which though not ſingly viſible, may be too great to be kept in a State of Fluidity by the diminiſh'd Heat of the Air.

A Mouſe lived ten Minutes at leaſt with a quarter Air, and three afterwards.

TITLE XLI.

Of heavy Bodies ſuſtained *in, or* taken up *into the Air.*

TITLE XLII.

Of Dew.

TITLE XLIII.

Of Rain.

AN eminent Virtuoſo informed me, that in the Country of *Campen*, he had ſeen divers Pits that are digg'd for Turf, or rather Peat, which were not deep, for the moſt part, but reach'd to a kind of quick Sand, upon which the Rain falling, did by Degrees in ſome Years, form a kind of ſlimy Earth or Clay, which was much of a martial Nature; and being skilfully handled, would yield good Iron.

The ſame Perſon aſſured me, that he had divers times diſtilled the Water of *Campen* in new and fine Glaſſes, and ſtill found them to leave a conſiderable Quantity of ſtony Matter at the Bottom, notwithſtanding the Rectification.

Quicquid erit, ſine fuco ſignificat, velut Rottenberg, Sileſiæ compaſtum appellant, perinde Mileſſow Temporum prognoſtes, jure merito dici poſſet. Vidi ex proximo totum aliquando montem denſiſſimis Nebulis contectum, eâ prorſus imagine, qua Mons Sinai Moyſe in Nebula latente depingitur, at cæteri circum Montes, innubes & hilares velut rerum gerendarun ignari ſtabant, Sol ipſe formoſiſſimus ibat; at accolæ locorum domum fugiebant, pecora urgebant, meque, ut domum protinus recipirem, properarem, & equos currum trahentes concitari juberem, monebant, neque horæ quadrans interceſſit, jam Cœlum obduci, Sol contegi, eripi omnis aſpectus.

L. 1. c. 8. De Mont. Bohemiæ, p. 26.

A Mileſſow monte temporum præſagia capiuntur.

Virg. Immenſum Cœlo ruit agnem aquarum;
——ruit arduus æther,
Et pluvia ingenti ſata læta, boúmque labores.

Diluit, implentur foſſæ, & quæ divinus Poeta proſequitur. At contra etiam accidere vidi, ut cæteri fumârint montes, Mileſſow nihil ſe commovente, nihil aut nubilum, aut turbidum minante; Incolæ rogati, nihil eſſe magnopere timendum à cæteris ſpondebant, hunc unum intuendum eſſe, horum nubila omnia à Mileſſow quodammodo devorari.

TITLE XLIV.

Of Hail.

ON ecrit de l'Iſle en Flandres le 25 May, ſtyle nouveau, qu'il tomba dans cette ville la une graiſle dout les moindres grains eſtoient comme des œufs de Pigeon. Cet orage a paſſé ſur la Citadelle & la ville, & na pas laiſſé une vitre entiere du coſte du vent: les maiſons ſont toutes decouvertes, & les arbres rompus, les bleds coupez, & les perdrix & les lieures morts. On a peſe pluſieurs grains de cette graiſle, dout les uns eſtoient d'un quarteron, de demi livre, de trois quarterons, et les plus gros d'une livre & d'avantage. Il y en avoit un entr' autres qui avoit dans le milieu une eſpece de matiere brune qu'ou mit dans le feu, qui fit faire un grand bruit. Il y en avoit un qui eſtoit diaphane, lequel eſtant mis aupres du feu, fondit tout auſſi toſt comme du plomb, quoy qu'il fut beaucoup plus dur que les autres.

TITLE XLV.

Of Snow.

TITLE XLVI.

Of other things falling *out of the Air.*

EO ipſo anno quo Dux Eboracenſis poſtremo rediit e Scotia Londinum, depluere tanta copia piſciculi halecibus colore, figurâ, ſapore quam ſimillimi in ſuperiore Gallocidiæ in Scotia parte non procul a mari, ut duo terræ jugera ad Robertum Murray de Brughton equitem pertinentia nunc Londini, ut audio, degentem, cooperuerint. Rem autem totam ſereniſſimo Duci Eboracenſi prius de eadem ab eo interrogatus, quod tum certior ab aliis de hâc pluvia factus eſſet, tanquam teſtis oculatus, ut qui aliquos horum piſciculorum videram, confirmavi: is porro ingenioſiſſime, ſummâque veri ſpecie nodum ita ſolvit, ut diceret hos piſciculos unà cum aquis furentium ventorum gyro in turbinem actis evectos eſſe nubes, e quibus non procul inde pondere rurſus ſuo relapſi fuerint in vicinam terram.

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